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DETERMINANTS OF TEACHER EXPECTATION: TEACHER SEX-ROLE IDEOLOGY, PUPIL SEX, PUPIL ABILITY

by

© ELLEN JOY LAZARE CURTIS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Determinants of Teacher Expectation: Teacher Sex-Role Ideology, Pupil/Sex and Pupil Ability" submitted by Ellen Joy Lazare Curtis in partial fulfillment of the requirements for the degree of Master of Education.

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Date 13 June 73

ABSTRACT

Several authors have called for the identification of the factors which influence teacher expectations and of the ways in which these expectations affect teacher behaviour. This study explored three possible determinants of teacher expectation: teacher sex-role ideology, pupil sex, and pupil ability, and their effects on the teachers' evaluations of science reports.

Student teachers (N = 50) were given hypothetical details concerning the sex and ability level of the pupils who authored two science reports. These student teachers, as well as students enrolled in an introductory educational psychology class (N = 220), also completed a sex-role stereotype questionnaire which provided a measure of sex-role ideology. Results of the three way analysis of variance (pupil sex x pupil ability x teacher sex-role ideology) indicated that the ability level of the child was a factor which biased the science evaluations: student teachers gave higher scores to pupils perceived to be of high ability than to those of low ability. The predicted interaction between sex-role ideology, pupil sex and pupil ability was not supported. The interaction between sex-role ideology and pupil sex was in the predicted direction but did not attain significance. Persons who believed that boys like science more than girls like science gave boys higher scores on the science reports. Those who believed that girls like science as much or more than boys like science, a contradiction of the stereotype, gave girls higher scores than boys.

The results and implications of the sex-role questionnaire and science report evaluations were outlined in the final chapter. It was concluded that there is a need for further research in the area of

teacher expectations and suggestions for such work were discussed.

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CHAPTER 1

INTRODUCTION TO THE STUDY

Merton (1948) observed that an individual who expects an event to occur changes his behaviour in ways which increase the probability of the event's occurrence. He described this phenomenon as the self-fulfilling prophecy.

Rosenthal and Jacobson (1968) aroused considerable attention when they showed that teachers' expectations were self-fulfilling. When teachers expected certain pupils to perform well, the children demonstrated performance in line with their teachers' expectations.

A steadily growing body of research supports the existence of teacher expectancy effects and in so doing leaves other important questions unanswered. How do differential expectations for pupil performance develop and how does the expectation once it has been made, maximize the likelihood of its prediction?

In this research an interaction model was used to answer these questions. That is, it was considered that certain characteristics of the child and the teacher combine to influence teacher expectations. More specifically, the aim of the study was to determine whether there is an interaction between a teacher's sex-role ideology and the teacher's knowledge of pupil sex and ability and whether this interaction effects the teacher's evaluation of science reports.

Significance of the Study

Educators have a vested interest in teacher expectancy effects. If, as Rosenthal and Jacobson (1968) conclude, high performance expectations enhance pupil performance, there is a possibility that

in raising teacher expectations, student learning can be maximized. Conversely there is a legitimate fear that teacher expectations may have the reverse effect and low teacher expectations may have detrimental consequences for student performance (Sutherland and Goldschmid, 1972).

Before teacher expectancy can be applied to effective educational use to increase the positive benefits and eliminate the negative effects, there is a need for greater understanding of the process of teacher expectations. It is necessary to determine the relevant child or teacher characteristics which may contribute to the Pygmalion effect and to discover how teachers' expectations become translated into performance differentials, problems only superficially dealt with by Rosenthal and Jacobson (1968). The results of this study may provide some insights to these factors.

There has been increasing concern in recent years, particularly among women, about the skewed distribution of the sexes in occupations which could be performed equally well by members of either sex. Science is one of these fields in which the number of women relative to men is proportionately lower than their representation in the population and this is becoming even more apparent as the ratio of American women to men in science has dropped over the past ten years (Baumrind, 1972).

Rossi (1964) insists that to balance the distribution of the sexes in the occupations it is necessary to remove the sex-linked associations long before the child has to make an occupational choice. This places some responsibility on the school to counteract the prevalent stereotypes. Rather than contributing actively to this effort the school is accused of reinforcing and perpetuating the stereotypes, and of educating children for the roles society expects them to play through its courses,

curriculum materials, teachers and counsellors (Baumrind, 1972; Burstyn, 1971; Karman, 1973; U'ren, 1972).

Such claims have remained on the conversational level for the most part. If it can be shown that teachers' expectations influence sex differences in achievement, this would provide one form of empirical support for these speculations.

The limited empirical research in this area may be partly due to the refusal of school boards to allow the relevant investigations to take place. As Sadker (1973) reports, the decision to ban a proposed workshop on 'Sexism in the Schools' was based on the claim that the district faced more important problems than sexual discrimination. That such attitudes and excuses are widespread was evident to this writer when she applied to the public school board in Edmonton for purposes of conducting this research in the schools. One administrator recommended that the study be refused on the grounds that the school board faced more pressing issues and furthermore he felt that nine out of ten people would agree with the hypothesis. The more formal reason for refusal was stated as ". . . difficulty in operationalizing the study."

Limitations of the Study

In interpreting the data the following limitations should be recognized:

1. The subjects in the study were not practising teachers (see above) but teachers in training. As such they have had limited experience in the task of evaluating pupil performance and may have been unfamiliar with the subject matter.
2. Only subjective judgements were made concerning the quality of the science reports as representative of grade 5 authors.

Outline of the Report

In Chapter 2 the literature relevant to the study is reviewed. This includes an overview of the teacher expectation studies which concentrated on the self-fulfilling effects of teacher expectations. Following these, a selection of studies which have focused on the process of teacher expectation and related studies which have explored the characteristics of the teacher and the child which may influence teacher expectations are presented.

Chapter 3 outlines the design of the study, wherein the hypotheses, sample, instruments and procedures are described, and Chapter 4 presents the results.

In the final chapter a summary of the results is reviewed and the implications and suggestions for further research are outlined.

CHAPTER 2

REVIEW OF THE LITERATURE

Teacher Expectations

In May, 1964, Rosenthal and Jacobson administered Flanagan's Test of General Ability to all pupils in kindergarten through grade six of 'Oak School'. The test disguised as the Harvard Test of Inflected Acquisition, was presented as one which would, " . . . allow us to predict which pupils were most likely to show an academic spurt." (Rosenthal and Jacobson, 1968, p. 66). Twenty percent of the children were randomly selected as 'late bloomers' and their names were submitted to teachers at the start of the following school year. All children were retested in January and May of 1965 and one year later in May of 1966. The conclusions of the study based primarily on the second set of post tests state, "When teachers expected that certain children would show greater intellectual development, these children did show greater intellectual development." (p. 82). More specifically they showed that the late bloomers gained more in total IQ and reasoning IQ than the controls and the expectancy advantage increased from the sixth down to the first grade.

The 'miraculous' results of the study (Coles, 1969) publicized in the book Pygmalion in the Classroom became a topic of great social interest. Retitled 'Great Expectations' by Kohl (1968) the study was cited as possibly providing the explanation for the poor performance of lower social class children. "Teachers of a higher socio-economic class expect pupils of a lower socio-economic class to fail." (Hutchins, reported by Elashoff and Snow, 1971, p. 9).

Not as well publicized were the many criticisms of Pygmalion.

(Brophy and Good, 1970; Buckley, 1968; Clairborn, 1969; Grieger, 1971; Jose, 1971; Snow, 1969). The most exhaustive of these were presented by Elashoff and Snow (1971). These authors admonished the study for incomplete descriptions of design, basic data and analysis. They were especially concerned that the presentation of the data be precise and explicit because of its release to the general public. Yet they found inconsistencies between text and tables as well as, " . . . overly dramatic conclusions, oversimplified, inaccurate or incorrect statistical discussions and analyses (which) all contribute to a generally misleading impression of the study's results." (p. 9). They point out that nonsignificant results were encountered in all but two of the eighteen classrooms studied and that one grade one and one grade two carried the whole sample. The concept of a generalized expectancy effect was thus severely questioned.

In various rebuttals Rosenthal (1969, 1970, 1972a, 1972b) defended his scholarship and conclusion that the Pygmalion effect was real. For different reasons both Rosenthal and Elashoff and Snow agreed that the teacher expectancy effect was an intriguiging hypothesis which merited further examination.

Indeed it has since been an engaging research problem. There were several attempts to replicate the Pygmalion experiment. In some the methodology was altered. Some researchers tried modifications of the experimental technique: teachers were provided with Kuhlman Anderson scores inflated by 16 points, actual Primary Mental Ability percentiles or no information (Fleming and Antonnen, 1971), actual IQ scores or scores inflated or reduced by 10 points (Pitt, 1956), the names of 'bright' students (Kester, 1971), or a whole class designated as the top group

(Flowers, 1966).

The expectancy was induced either early in the year (Evans and Rosenthal, 1969) or postponed until the spring term (Conn, Edwards, Rosenthal & Crowne, 1968). The time interval between the experimental inductancy of the expectation and the retesting for its effects was varied from fifteen minutes (Beez, 1970) to a year (Evans and Rosenthal, 1969). First and second grade students were frequently used as subjects as the suggestion of an expectancy effect seemed strongest in the early grades, however, the full grade spectrum, from grade one through six, junior high, and college students have also been studied (Baker and Crist, 1971).

The results of these various studies showed mixed support for the Pygmalion effect. The findings of Evans and Rosenthal (1969) support the existence of the Pygmalion effect, however, these researchers report a reversal of the original results in that girls expected to bloom gained less in reasoning IQ than the non-bloomers, while the male bloomers gained more than the male non-bloomers on reasoning IQ. Conn et al. (1968) found an initial expectancy advantage for the late bloomers but the advantage (which was not significant) was lost and late bloomers ultimately gained less IQ points than the controls on the final set of post tests. Sutherland and Goldschmid (1972) did not find any evidence of an expectancy advantage but they do report an expectancy disadvantage which occurred when teachers held low expectations for high ability students.

In general, those studies which dealt with the effect of teacher expectation on IQ change almost invariably produced nonsignificant results (Clairborn, 1966; Fleming and Antonner, 1971; Grieger, 1970; Jose, 1971; Kester, 1971). This conclusion seems warranted in light of the

literature on the nature and stability of human intelligence (Jensen, 1968). Nevertheless, at least Baker and Crist (1971) are optimistic that over an extended period of time teacher expectation may contribute to changes in student intelligence.

Many researchers turned their attention to dimensions of pupil performance other than IQ gain and were more successful in demonstrating the existence of a teacher expectancy effect. For example Beez (1968) showed that children whose tutors expected good symbol learning were taught and learned more symbols than children of tutors led to expect poor symbol learning. Palardy (1969) found a significant gain in reading achievement in those students expected to read better. Teacher expectation was shown to affect assignment to reading group (Rist, 1970), academic performance (Seaver, 1971), classroom behaviour (Meichenbaum, 1969) and pupil attitudes (Pitt, 1956). These studies lend support to the expectancy effect.

In their summary of the experimenter bias phenomenon, Barber and Silver (1968) concluded that, " . . . the experimener bias effect appears to be more difficult to demonstrate and less pervasive than was implied . . ." (p. 23) and this conclusion may also apply to research involving teacher expectations (Grieger, 1971). However, an indication that this conclusion is being challenged is evident in the number of paper and theses which continue to be published and presented.

Much of the recent research in teacher expectation is directed more toward exploring the process of teacher expectation and less toward proving or disproving the veracity of a teacher expectancy effect. The studies which show how teacher expectation develops and results in a self-fulfilling prophecy are reviewed in the following section.

In summary, Rosenthal and Jacobson's findings that teachers' expectations were responsible for gains in student intelligence scores initiated a flurry of research activity. Unsuccessful replications of the Oak School experiment cast doubt on the existence of a teacher expectancy effect. However, studies which examined aspects of student performance other than IQ change, suggest that teachers' expectations do affect student behaviour. In recent research, experimenters have tried to resolve how the expectations develop and operate to elicit self-fulfilling prophecies.

The Process of Teacher Expectation

Brophy and Good (1970) offer a tentative outline of how teacher expectations may operate to elicit self-fulfilling prophecies:

a) The teacher forms differential expectations for student performance;

b) He then begins to treat children differently in accordance with his differential expectations;

c) The children respond differently to the teacher because they are being treated differently by him;

d) In responding to the teacher, each child tends to exhibit behaviour which complements and reinforces the teacher's particular expectations for him;

e) As a result, the general academic performance of some children will be enhanced while that of others will be depressed, with changes being in the direction of teacher expectations;

f) These effects will show up in the achievement tests given at the end of the year, providing support for the self-fulfilling notion. (pp. 365-366)

Brophy and Good (1970) have shown that teachers treated children in accordance with their expectations. Teachers consistently favored the 'highs' in demanding and reinforcing quality performance. When the 'highs' responded incorrectly, or were unable to respond, teachers were

less critical and more persistent in trying to elicit the correct answer than they were with the 'lows'. They were more frequently praised following correct answers and more likely to receive feedback than the 'lows' irrespective of the correctness of the answer. Jeter and Davis (1973) studied grade 4 social studies classes with similar results.

Other studies using interaction analysis lend support to the conviction that teacher expectations are translated into differential teaching behaviours (Kranz, 1970; Rubovits and Maeher, 1971; Rothbart, Dalfen, and Barrett, 1971).

Finn (1972) has shown that grading behaviour in particular is affected by teacher expectation. He gave teachers essays to rate along with false biographical information describing the author in terms of race, age, sex and ability and found that in certain settings (notably urban) the induced expectancy set was strong enough to bias the evaluations of the children's work. This study is important for our purposes because it shows that teachers are influenced in their judgements by the information provided concerning a child and that they give higher ratings to those essays presumed to have been written by bright children.

Two other studies demonstrate the differential grading which results from induced expectancy information. Cahen (1969) provided information about the child's IQ and reading group assignment to accompany a reading readiness test. The pupils perceived to be bright received higher scores than the dull pupils on the readiness test.

Simon (1969) extracted several items from the vocabulary sub-test of WISC protocols. College student raters, told that children were either above average or below average in ability, gave higher scores to

pupils who were supposedly above average than to those who were below average in ability.

The results of these studies show how an expectancy advantage can work for a bright student and against a dull student. In each study the stimulus was identical and suggests that the hypothetical ability information was responsible for the difference in the ratings.

In summary, the studies support the hypothesis that teacher expectations result in changes in teacher behaviour. The last few studies demonstrate how teacher expectations are directly translated into performance differentials for the children.

Child Characteristics

One of the most important determinants of teacher expectation is the ability or achievement level of the child. The results of intelligence and achievement tests, grade point averages, labels which refer to potential such as 'late bloomer' or 'spurter' and the ability level of an older sibling are strong determinants of teacher expectation (Beez, 1968; Finn, 1972; Kranz, 1970; Rubovits et al., 1970).

But ability is not the sole determinant of teacher expectation. One of the limitations of the typical experimental inductancy technique whereby an outside consultant provides teachers with the names of children expected to show accelerated growth, is the assumption that teacher expectation is singularly determined. Grieger (1971) reminds us that teachers are not 'ignorant boobs' who have no mind of their own and questions whether it is at all reasonable to expect teachers to believe an outside consultant's recommendation

when she has so much 'real data' of her own.* The possibility that the expectancy inductancy technique itself may be responsible for the lack of significant findings in expectation studies should be closely examined. In those studies where the manipulation of teacher expectations took place after the teacher had a chance to form her own impressions, it is questionable whether the experimental inductancy technique had its desired effect.

Other criteria often non-academic in nature are involved in determining a teacher's expectations. That the child's social class has a significant effect on how teachers rate children on school-related tasks was shown by Mazer (1970). Depending upon whether the teacher believed the child to be middle class or disadvantaged, the child was rated differently on his probable performance.

Evidence that social class may be an important determinant of teacher expectation was also provided by Palardy (1969) and Rist (1970). Rist theorizes that teachers have an 'ideal' type of student in mind based on the characteristics which he assumes to be essential for academic success. These characteristics are closely related to middle-class criteria. The child's appearance, his command of standard English, his family's education, employment and interpersonal relations all contribute to a teacher's expectancy set.

Assuming the logic of Rist's model that teachers have in mind an 'ideal' student, one might speculate that a child's sex is an important factor in determining teacher expectations. The 'ideal' student is neat,

---

* The feminine form of pronoun for the singular indeterminate gender is substituted throughout for the masculine form in view of the fact that the majority (approximately 74%) of elementary school teachers in Alberta are female. (Dominion Bureau of Statistics, 1969-70).

passive, docile, submissive, conforming, obedient and compliant (Jackson, 1968; Henry, 1969; Silberman, 1970). These characteristics are generally seen as more descriptive of the female (Broverman, 1972). It might be assumed therefore that girls would have an expectancy advantage over their male peers as their characteristics closely match this ideal. As Silberman (1970) notes, "Passivity and docility are more in keeping with the behaviour the culture expects of girls outside of school than the behaviour it expects of boys." (p. 52).

It is well known that girls receive better grades than boys throughout school although this is especially true in the elementary grades (Jones, 1969; Kagan, 1968; Kolesnik, 1969; Tyler, 1969). Boys outnumber girls in almost every type of academic problem (Bentzen, 1966). There are a greater number of boys than girls who repeat grades at all levels in each of the ten provinces of Canada and a greater percentage of boys who are placed in special classrooms (Jones, 1969).

The view that the inferiority of boys is due to the femininized environment of the school and the female teachers' inability to accept male aggressive behaviour has received considerable support in the literature (Davis and Slobodian, 1967; Drews, 1961; Felsenthal, 1970; 1971; Garai and Scheinfeld, 1968; Grambs and Waetjen, 1966; Peltier, 1968; Sexton, 1965). As early as 1909 Ayres remarked that the schools were more suited to the needs and natures of the female students. St. John claimed that the underachievement of boys was due to:

> . . . a maladjustment between the boys and their teachers which is the result of interests, attitudes, habits and general behaviour tendencies of boys to which teachers fail to adjust themselves and their school procedures as well as they do the personality traits of girls. (St. John, 1932, p. 668).

Silberman (1970) sees the problem as cumulative and reinforcing. "The

behaviour demanded in school is more feminine than masculine; girls adapt better; therefore the school and an interest in school affairs, tend to be defined as feminine." (p. 52). (It is curious that the feminine environment of the school is generally regarded as a problem only for the males in the classroom Rossi, 1965).

Although the experience of schooling is clearly different depending upon one's sex (Jackson and Lahaderne, 1971), it is difficult to ascertain whether either sex has an expectancy advantage. Brophy and Good (1970) describe the male child as the more salient one in the teacher's perceptions. By using interaction analysis, studies have shown that teachers have more interactions with boys than girls, although many of these contacts are negative and disapproving. Boys are more likely to be rejected, ignored and criticized (Brophy and Good, 1970; Felsenthal, 1970, 1971; Meyer and Thompson, 1956; Jackson and Lahaderne, 1971). However, the same studies also report that boys receive more teacher praise, more direct teaching, more teacher attention, more response opportunities and greater acceptance of their ideas and feelings.

The more frequent instances of both positive and negative teacher contact may be indicative of the teacher's higher expectations for boys. The more evaluative style of interaction with the male suggests teacher pressure to achieve (Baumrind, 1972). However, studies such as these which use interaction analysis lend themselves to a variety of interpretations.

Studies which more directly addressed the issue of sex as a determinant of teacher expectation are more instructive. Doyle (1970) asked teachers to estimate the cognitive ability of first grade boys and girls. He found support for his hypothesis that the ability of boys

would be biased downward and that of girls upward with a corresponding advantage in reading achievement.

Palardy (1969) asked teachers to assess the percentage of boys relative to girls who could be expected to be successful in reading. On the basis of the response he divided teachers into two groups: Group A teachers who believed boys would be equally successful and Group B teachers who believed boys would not read as well as girls. The results of his study show a significant interaction between teacher belief and sex of the student. The boys of Group B scored significantly lower than the girls of Group B. Furthermore, their reading achievement was inferior to the boys and girls of Group A. These results are important for our purposes in illustrating not only the operation of an expectancy effect, but in demonstrating the interaction between teacher beliefs and pupil sex in determining educational outcomes.

In summary, several child characteristics which are important in forming teacher expectations have been considered. The child's socio-economic status, his ability and his sex are among these.

The following section considers the teacher characteristics which contribute to the expectancy effect.

Teacher Characteristics

The characteristics of the child which determine a teacher's expectations must relate to the teacher as perceiver. While it is possible to speculate that factors such as ability, social class and sex will influence a teacher's expectations, it is necessary to consider whether these are critical factors to particular teachers.

Finn (1972) found a significant difference in the way urban and suburban teachers evaluated children. Only the suburban teachers

evaluated all children equally with little regard to the child's sex, ability and race which were provided by the experimenter.

Another example which demonstrates that the characteristics of the child which bias a teacher's expectations cannot be considered independently of the teacher as perceiver is provided by Fleming and Antonnen (1971). The extent to which the teachers held IQ tests in positive regard was found to have a significant effect on the child's performance gains. The children of teachers who either highly or mediumly valued IQ tests gained more in comparison to children of teachers who only weakly valued IQ tests.

The extent to which the child's sex influences teacher expectation may well depend on the teacher's sex role ideology. Sex-role ideology may be presumed to range from an egalitarian conception of the sexes to its polar extreme, a sexist ideology. Rossi (1964) describes equality of the sexes as:

> . . . a socially androgynous conception of the roles of men and women, in which they are equal and similar in such spheres as intellectual, artistic, political and occupational interests and participation, complementary only in those spheres dictated by physiological differences between the sexes. (p. 99).

A sexist ideology implies different roles for males and females.

There is little doubt that there are very well defined conventions surrounding the kinds of behaviour, attitudes, interests and vocations which are appropriate to men and women (Broverman, Vogel, Broverman, Clarkson & Rosenkrantz, 1970).

Many studies show that stereotypes associated with masculinity and femininity are clearly defined (Lunneborg, 1972; Komarovsky, 1950), highly conventional (Komarovsky, 1950; McKee and Sheriffs, 1959), persistent (Fernberger, 1948) but exaggerated (Lunneborg, 1972).

Rosenkrantz et al. (1968) asked college students to describe, according to 122 bipolar traits, the characteristics of an adult male and an adult female. Using as a criterion for stereotypy, a 75% agreement that one pole was more descriptive of either masculinity or femininity, he found that 48 items were stereotypic. The difference between the masculinity response and the femininity response on each of these items was significant ($p < .001$). Furthermore, the consensus of agreement between the male and female students on the masculinity response ($r = .96$) and the agreement between these two groups on the femininity response ($r = .95$) was very strong indeed.

Factor analysis of the questionnaire revealed two factors: competency, and warmth and expressiveness. The first factor consisted of items which were found to be socially desireable in the male and the second factor consisted of those traits which are socially desireable in the female. These factors are very similar to the potency and social behaviour factors found by Reece (1964) and Sappenfeld (1966).

One might expect that some change in these stereotypes would have resulted from the efforts of organized groups to raise women's consciousness, to improve their collective lot and to combat discrimination (Bird, 1970; Malmo-Levine, 1972). Bardwick and Douvan (1971) indicate that college students refuse to be stereotyped by "simplistic and inaccurate" role prescriptions. Spence and Helmerich (1973) have noted that change in men's and women's acceptance of competent women with masculine interests indicates a change in the direction of egalitarian thinking of the sexes. Finally, Bowers (1971) refers to the psychologically androgynous nature of man as a long awaited truism and suggests that the battle of the sexes has been "neutralized if

not neuterized" (p. 16).

However, Rosenkrantz et al. (1968) and Broverman et al. (1970, 1972) found little conclusive evidence to support these contentions. The stereotype questionnaire has been administered to over 1,000 subjects differing in age, sex, religion, educational background and marital status with much the same results. Toews (1973), using the same questionnaire found high agreement across six diverse groups on 76 items, and stereotypy in the same 48 items designated as such in the Broverman et al (1972) sample.

Persons who accept the stereotypes or sex role standards are likely to encourage others to act in accordance with the cultural consensus (Broverman, 1970; Farmer, 1970; Thomas and Stewart, 1971). These studies relate to the consequences of an adherance to traditional conventions in the counselling setting. Little research was found which was concerned with the consequences in the teaching situation.

Garai and Scheinfeld (1968) refer to a sex role chauvinism in the schools and point to the fact that science is generally taught in the school by males and hence in a masculine manner that does not cater to the needs of girls. These authors, as well as Kagan (1964) have implied that the teacher (and their female pupils) are not uncomfortable about their incompetence in science because they are not supposed to do well in this "male dominated" (Peltier, 1968) field. It is instructive to note in light of these observations that one exception to the 'girls do better in school' rule is science, in which boys typically outperform girls (Thomas, 1972; Waetjen, 1966). The girls who are successful in science are those who are more masculine in character (Kagan, 1964).

To summarize, the expectations which teachers develop are in part

determined by teacher attitudes and personal expectations. The existence of sex-role stereotypes is well documented and the teacher's adherance to these conceptions may well be a factor which influences these expectations.

CHAPTER 3

DESIGN OF THE STUDY

The Research Variables and Hypotheses

The present study was designed to examine the effect of teacher's sex-role ideology and knowledge of pupil's ability and sex on the evaluation of science reports. It was expected that the teacher's knowledge of pupil ability would have a direct effect on her grading of pupil performance. The literature reviewed suggested that a pupil perceived to be of high ability would be given higher ratings than one who was perceived to be of lesser ability.

There was little reason to assume a main effect of teacher sex-role ideology, rather it was hypothesised that there would be an interaction between sex role ideology, pupil ability and pupil sex. On the basis of the literature it was possible to speculate that boys would be given higher grades than girls as this would be consistent with the stereotype, and that 'high' sexists would assign higher grades to high ability boys than to high ability girls, higher grades to low ability boys than to low ability girls, and the 'low' sexists would treat both sexes equally.

There were three independent variables:

Variable 1: sex-role ideology of the teacher

Variable 2: pupil ability

Variable 3: pupil sex

Sex-role ideology was measured by a stereotype questionnaire and two scores were obtained to divide subjects into high and low scoring scoring groups. One was the factor score based on the first principal

component solution to the factor analysis of the stereotype questionnaire the second was based on a single item (item 9) from the stereotype questionnaire which assessed the extent to which subjects indicated boys and girls like science.

The dependent variable was the science report rating. Two criterion were used: the total score, or the sum of the ratings, and the global score, or the 'overall quality' rating.

It was hypothesised that:

1. Reports perceived to have been written by high ability children would receive higher ratings than reports perceived to have been written by low ability children.
2. There would be significant differences in the ratings of boys and girls' reports by teachers who differed in sex-role ideology.

The Sample

The sample consisted of two groups of students at the University of Alberta. The men and women (n=220) enrolled in an introductory Educational Psychology class (Educational Psychology 271) made up the first group. The mean age of the men was 19 and the mean age of the women was 19. The majority of the students were in first year Education (60%) however, second, third and fourth year Education students (34%) and students from other faculties (6%) defined the group.

Students (n=53) in the second group were enrolled in the Faculty of Education Science curriculum courses. These constituted the three sections in the Education Curriculum and Instruction 220 course, one section in the 330 course and one in the 420 course.

As Educational Psychology 271 is a first year course and the

curriculum courses are not normally offered until the second year, only three students were involved in both groups. These students were contacted and arrangements were made for them to complete the instruments on only one occasion.

The Instruments

1. The Stereotype questionnaire

The stereotypic items from a longer sex role questionnaire developed by Rosenkrantz et al. (1968) formed the basis of the instrument used to measure sex role ideology.

As the original intent was to obtain a measure of sex-role ideology that would be sensitive to attitudes to children, the original instructions for the questionnaire which directed people to respond on the basis of their expectations for adult men and adult women, were changed to elicit responses to expectations for boys and girls. Some of the items which were stereotypic of men and women but were inappropriate to boys and girls (for example: is skilled in business) were eliminated and others, suggested by the literature review of teacher perceptions of boys and girls, were included. A table of random numbers was used to balance the social desireability of the items equally on the two extremes of the bipolar scale. To control for order effects, half of the instructions were presented with the directions for the girls first, and half originated with the directions for the boys.

Following the pilot run numerous students expressed difficulty in completing the stereotype questionnaire with the revised directions. As a result, the original instructions specifying that the questionnaire be completed with the adult male and adult female as referent were adopted but the item content was unchanged.

A copy of the instructions and the stereotype questionnaire is contained in Appendix A.

2. The Science Reports

The science reports were stapled in booklets along with the directions and the rating scale. Two reports were contained in each set. These were selected on the basis of judgements concerning their equivalence and suitability as stimuli. The two reports were identified as having been written by 10 year old grade 5 children. (In fact, they were done by grade 6 children but were judged to be more representative of the average grade 5 child's performance). In addition, information relating to the author's sex, ability and achievement level were printed above each report. Thus each booklet contained two reports classified as having been written by a high ability male and a high ability female, or by a low ability male and low ability female. The rating scale was comprised of several dimensions on a seven point scale ranging from very poor to very good.

To control for order effect half the booklets contained the female-authored report first and the other half began with the male's report. A sample booklet is contained in Appendix B.

Procedures

The study was conducted in three stages in the last two weeks of the winter session term. The pilot run, the administration of the stereotype questionnaire to the educational psychology students and the administration of the stereotype questionnaire and science reports to the experimental group are described in this section.

The pilot run was conducted with the students enrolled in Ed. C.I. 330, an upper level science course, in order to test the

suitability of the instruments. Students were told that two tasks were involved and that the primary concern of the study was the inter-rater reliability in grading science reports. Students completed the evaluation of the reports and then the stereotype questionnaire was administered.

In the discussion which followed the students expressed difficulty in completing the questionnaire. They suggested that a description of a grade 5 girl might not be appropriate to the grade 1 female and it was evident from these remarks that the instrument would measure a highly specific age-related sex-role attitude. The decision to revert back to the original instructions was based on these observations. As a result of the pilot study some confidence could be placed in the procedures used as the students were unaware of the true nature of the task.

The administration of the stereotype questionnaire to the educational psychology class took place during the last class meeting. Attendance was high (80%) and thus the only response bias would appear to be that of class-attenders versus class non-attenders. The students were not alerted in advance that testing would take place. The experimenter and the professor came to class and the professor outlined an agenda that began with participation in research. He announced that a graduate student wished to obtain data for a Master's thesis and encouraged their participation by expressing the important contribution of research to the educational process. The experimenter then informed the students that she had prepared a short questionnaire and requested their involvement in the study. The experimenter and some student assistants distributed and later collected the completed questionnaires.

The administration of the questionnaire and reports to the experimental group took place during the class hours in which the science

classes normally met. The procedure followed was similar to that of the pilot study. The experimenter was introduced as a graduate student who had requested student participation in a research study. The students were informed that two tasks were involved and the first was disguised as a study of inter-rater reliability. Science booklets were randomly distributed and the questionnaire was handed out upon completion of the evaluations. No mention was made of the nature of the second task.

The number of people receiving each type of booklet is shown in the table below:

TABLE 1

DISTRIBUTION OF SCIENCE REPORTS

Booklet	Report 1	Report 2	N
1	High ability male	High ability female	14
2	Low ability male	Low ability female	13
3	High ability female	High ability male	13
4	Low ability female	Low ability male	11

Analysis of the Results

To test for stereotypy correlated t-tests were applied to each item of the questionnaire in the sample of men and women. Stereotypy was assumed if the difference between the average masculinity response (average response to the male directions) and the average femininity response (average response to the female directions) exceeded the .001 level of significance in both the sample of male and female students.

Two separate factor analyses (one for the male sample, one for the female sample) were applied to the difference scores between masculine and feminine responses. A principal component solution followed by a varimax rotation was used to identify factors of sex-role ideology.

The first principal component was used to obtain factor scores, and the factor score and the difference score of item 9 (dislikes math and science . . . . . likes math and science) were used to differentiate between sexist groupings. As the solution to the first principal component was different in the sample of males and females, the male subjects were eliminated from further analysis that tested the effects of sexism.

A three way fixed effects analysis of variance design with repeated measures on one factor (pupil sex) was used to test the hypothesis. All subjects (N = 53) were observed under the male and female conditions but were nested with respect to sexism and pupil ability (Winer, p. 338). Subjects were randomly discarded to yield an equal N in all cells.

The ability by sex effect was also tested by a two way analysis of variance design and the entire sample was used (N = 53) as the factor of sexism was eliminated from this analysis.

CHAPTER 4

RESULTS AND FINDINGS

It was integral to the study to show that the concept of sexism was meaningful. If the students did not perceive differences between men and women an androgynous conception of the sexes would have to be assumed and there would be no logical basis for the expectation that subjects would react differently to male versus female-authored reports. Therefore, the results of the stereotype questionnaire are presented first and provide a framework for the other findings.

The responses to 204 questionnaires were used in the analysis. Sixteen had to be discarded either because they were incomplete or because the students refused to respond. The comments of one student summarized the remarks of this latter group, "This test seems to try and stereotype male and female behaviour and characteristics. I think both are 'people' with their own interests and behaviour. Distinct and individual."

The remaining questionnaires were analysed separately for the males (N = 92) and the females (N = 112). Correlated t-tests provided a means of testing whether the differences between the masculinity and femininity responses were significantly different. These results are presented in Table 2.

In the male sample 32 of the 48 items would qualify as stereotypic as the difference between the masculine and feminine means exceeded the .001 level of significance. Eight items might be termed differentiating as the mean difference met the .05 level of significance. The remaining 8 items clearly did not differentiate between males and females at all.

TABLE 2

MEANS, MEAN DIFFERENCES ON STEREOTYPE QUESTIONNAIRE UNDER MALE AND FEMALE DIRECTIONS, SEPARATED BY SEX

ITEM	MEANS FOR MALE SAMPLE (N=92)			MEANS FOR FEMALE SAMPLE (N=112)		
	MALES	FEMALES	M DIFF	MALES	FEMALES	M DIF
1.	34.58	44.30	- 9.73 ***	33.48	42.82	- 9.34 ***
2.	30.91	38.53	- 7.62 ***	28.08	35.73	- 7.65 ***
3.	38.62	47.91	- 9.29 ***	37.12	50.14	-13.02 ***
4.	42.75	38.46	4.29 **	42.09	41.11	0.97
5.	45.12	39.59	5.53 ***	48.51	40.09	8.42 ***
6.	43.58	33.62	- 9.96 ***	47.46	34.59	12.87 ***
7.	43.26	46.95	- 3.68 **	42.46	47.96	- 5.49 ***
8.	47.35	36.29	11.05 ***	50.27	40.46	9.81 ***
9.	39.41	45.64	6.23 ***	38.81	46.21	- 7.39 ***
10.	33.47	45.64	-12.17 ***	35.57	43.27	- 9.70 ***
11.	49.85	43.42	6.24 ***	50.68	46.81	3.87 **
12.	43.40	35.16	8.24 ***	40.51	35.66	4.85 ***
13.	37.13	52.30	-15.17 ***	41.51	52.69	-11.18 ***
14.	50.88	44.45	6.33 ***	49.92	46.79	3.13 **
15.	49.30	43.05	6.24 ***	50.29	46.54	3.74 **
16.	33.18	30.50	2.68	34.88	30.25	4.62 ***
17.	31.93	32.39	- 0.46	33.86	31.49	2.37 *
18.	31.15	37.08	- 5.92 ***	31.20	35.87	- 4.68 ***
19.	45.25	36.06	9.20 ***	42.72	31.00	11.72 ***
20.	54.73	49.96	7.77 ***	51.29	46.60	3.70 ***
21.	47.83	52.71	- 4.88 ***	46.88	54.33	- 7.46 ***
22.	46.63	43.98	2.65 *	47.75	43.05	4.70 ***
23.	48.92	57.83	- 8.90 ***	49.69	57.71	- 8.02 ***
24.	35.50	32.01	3.49 *	33.09	30.86	2.23 *
25.	29.20	37.89	- 7.99 ***	31.09	37.33	- 6.24 ***
26.	29.09	34.04	- 4.96 ***	28.51	34.38	- 5.87 ***
27.	48.52	48.73	- 0.21	49.53	49.43	0.10
28.	31.77	32.02	- 0.25	31.70	32.79	- 1.09
39.	30.14	45.73	-15.59 ***	28.74	47.31	-18.53 ***
30.	48.62	39.33	9.29 ***	48.58	43.89	4.69 ***
31.	45.84	53.86	- 8.02 ***	46.86	52.77	- 5.91 ***
32.	41.34	37.60	3.74 ***	40.70	39.91	0.79
33.	50.50	48.50	2.00	51.20	47.45	3.75 ***
34.	35.40	42.88	- 7.48 ***	34.23	42.62	- 8.38 ***
35.	40.78	49.29	- 8.51 ***	42.34	50.05	- 7.71 ***
36.	31.05	35.61	- 4.55 **	28.88	35.71	- 6.83 ***
37.	31.80	42.87	-11.07 ***	34.29	40.54	- 6.15 ***
38.	35.61	45.40	- 9.79 ***	33.69	39.62	- 5.93 ***
39.	37.07	43.10	- 6.03 ***	39.08	40.90	- 1.82
40.	37.77	31.85	5.92 ***	37.88	30.55	7.33 ***
41.	43.50	40.71	2.79 *	45.24	41.68	3.56 **
42.	46.91	49.93	- 2.52 *	48.06	49.16	- 1.10
43.	38.90	36.55	2.35	39.20	37.78	- 1.42
44.	42.97	35.49	7.48 ***	40.97	35.62	5.35 ***
45.	43.50	53.17	- 9.68 ***	46.99	53.69	- 6.70 ***
46.	48.11	46.14	1.97	46.31	47.55	- 1.24
47.	43.82	45.56	- 1.64	44.37	46.28	- 1.91 *
48.	36.92	30.78	5.93 ***	36.93	32.70	4.23 ***

$p < .05$
$p < .01$
$p < .001$

The results for the female sample are similar in strict number. Thirty-two items can be assumed to be stereotypic, 8 were differentiating, while 8 were not sufficiently different to denote stereotypy.

Correlations between the men's and women's response to the male directions ($r = .96$) as well as their response to the female directions ($r = .96$) indicate a strong agreement in describing adult men and women. The correlations of the male-female difference scores across the two samples ($r = .93$) substantiates that their perceptions of men and women were very similar.

The items corresponding to the three categories of items were not always the same in both groups. The results (Table 3) of the combined sample indicate that 27 items were stereotypic, 9 differentiating and 12 non-differentiating. It is obvious that stereotypes are not immutable as these results show that many of the stereotypes no longer apply. However, many of the stereotypes have persisted and this is consistent with a sexist ideology.

To gain a better understanding of the nature of sex role ideology separate factor analyses were performed on the male-female difference scores. A principal components solution was obtained and a varimax rotation was then applied to the principal axes factors. The correlation matrix showed 10 eigenvalues greater than one, but only the first four factors were interpreted. The fifth factor in both the samples loaded heavily on items which did not discriminate between the sexes and thus provided a logical stopping point. (These results are reported in Appendix C).

The first factor in the varimax rotation of the principal axes solution accounted for approximately 23% of the total communality. It is

TABLE 3

STEREOTYPIC, DIFFERENTIATING AND NON-DIFFERENTIATING ITEMS

COMBINED SAMPLE
(N=220)

ITEM	FEMALE POLE	MALE SAMPLE
	STEREOTYPIC ($p < .001$)	
1.	not very aggressive	very aggressive
2.	not at all independent	very independent
3.	very emotional	not at all emotional
5.	very easily influenced	not at all easily influenced
6.	almost never hides emotions	almost almost hides emotions
8.	very submissive	very dominant
9.	dislikes math and science	likes math and science very much
10.	very excitable in a minor crisis	not at all excitable in a minor crisis
12.	very tactful	very blunt
13.	very gentle	very rough
19.	feelings easily hurt	feelings not easily hurt
20.	not at all adventurous	very adventurous
21.	very aware of feelings of others	not at all aware of feelings of others
22.	very interested in own appearance	not at all interested in own appearance
25.	has difficulty making decisions	can make decisions easily
26.	gives up easily	never gives up easily
27.	cries very easily	never cries
30.	almost never acts as a leader	almost always acts as a leader
31.	very neat in habits	very sloppy in habits
34.	very uncomfortable about feeling aggressive	not at all uncomfortable about feeling aggressive
35.	very strong need for security	very little need for security
37.	unable to separate feelings from ideas	easily able to separate feelings from ideas
38.	very dependent	not at all dependent
40.	enjoys art and literature very very much	does not enjoy art and literature
44.	not at all reckless	very reckless
45.	very sensitive	very insensitive
48.	very careful	very careless
	DIFFERENTIATING ($p < .05$)	
7.	very talkative	not at all talkative
11.	very passive	very active
14.	not at all competitive	very competitive
15.	very illogical	very logical
18.	very sneaky	very direct
22.	not at all assertive	very assertive
24.	very respectful	very disrespectful
36.	not at all ambitious	very ambitious
41.	very conceited about appearance	not at all conceited about appearance
	NON-DIFFERENTIATING ($p > .05$)	
4.	very subjective	very objective
16.	very helpful	not at all helpful
17.	not at all eager	very eager
27.	not at all outgoing	very outgoing
28.	never does things without being told	does things without being told
32.	very quiet	very loud
33.	not at all self-confident	very self-confident
39.	very compliant	very defiant
42.	very co-operative	not very co-operative
46.	never thinks before acting	always thinks before acting
47.	not at all troublesome	very troublesome

probably best interpreted as the 'sensitivity' factor. The items with highest loadings on this factor relate to the differences in sensitivity, emotional strengths, susceptibility to influence, and the more symbolic projection of sensitivity-appreciation of art and literature.

The second factor accounted for approximately 8% of the total communality. The items which define it relate to the different ways males and females experience aggression and others' feelings. It might be called an 'empathy' factor.

A third factor is descriptive of leadership. Some of the characteristics of a leader: outgoing, loud assertive, load heavily on this cluster as does the item: acts as a leader.

The fourth factor refers to emotional and aggressive differences. A person with a high score on this factor would attribute aggression and roughness to the male, and the absence of these qualities to the female.

The factors which accounted for the M-F differences in the female sample were slightly different. The first factor represented approximately 11% of the total communality. The differences which loaded heavily on this factor are those which relate to self and emotional expression.

Dependency differences define the second factor. The differing needs of males and females for security and dependency enter into this group.

A third factor is probably best described as 'fortitude'. The differential ability of males and females to make decisions and persist at a task are relevant here. It may be considered to be similar to the leadership factor previously described.

The fourth factor to emerge is similar to the fourth factor in

the male sample and refers to differences in submissiveness and aggression.

These factors were very similar to the potency and social-behaviour factors which Reece (1964) discovered. The factors indicate that sexist attitudes are formed mostly on the basis of differences in warmth and expressiveness, and this is consistent with the findings of Broverman et al. (1972). A second factor which these authors noted, competency, was not apparent in this case. Inspection of the items which formed this cluster, including active, logical, self-confident, acts as a leader and ambitious, revealed that there were no significant differences between the masculine and femininine responses and it would not be expected therefore that these items would emerge in the factor analysis of the male-female differences.

As no competency factor was apparent and the factors which did result related to very specific attributes of males and females which bore no clear relationship to the nature of the task at hand, the first principal component appeared to be the most appropriate measure to differentiate between sex role ideologies. The first principal component which accounts for the maximum variance of all items was a better measure of one's sex role ideology because it provided an overall rather than a very specific measure of sex role ideology. (The loadings are reported in Appendix D).

Factor scores on this more global criterion were determined and used to dichotomize subjects into high and low scoring groups. Approximately half the scores which resulted from this measure were negative. This implied that many persons have reversed the traditional stereotypes, assigning to women characteristics which were previously attributed to men and vice versa. This finding necessitated a change in

the conceptualization of sex role ideology. Whereas it was presumed that sex role ideology could be described in terms of 'high' and 'low' sexists, or those people who saw large differences between men and women versus those who hardly attributed any difference at all, it was evident that not only the magnitude but the direction of the difference is a factor which must be taken into account in differentiating sex role ideologies. There is a qualitative difference between people who hold to the traditional differences between the sexes and those who have imposed a new direction on the differences.

As the number of people whose scores were negative constituted almost half of the subjects, it was necessary to combine these subjects with persons who perceived only minimal differences between the sexes. These persons could not be designated as low sexists as they do see large differences between the sexes and so they are herein described as holding a contemporary view of sex role ideology. The remaining subjects whose high positive scores reflected an adherence to the traditional consensus of masculinity and femininity were referred to as the traditional group.

The change in the groupings which these results necessitated, made it impossible to test the hypothesis that low sexists would react similarly to children regardless of sex. Instead it was hypothesized that 'traditionals' would award boys higher grades than girls and the reverse would be true of the 'contemporaries' - they would award higher scores to the girls.

The results of the 3 way analysis of variance using the first principal component to differentiate between traditional and contemporary persons are shown in Table 4 for the total and global score criterions. As previously discussed, it was expected that the main effects of sexism and

pupil sex would not be significant and the data supported this. However, the second hypothesis was not supported: there was no strong indication of an interaction between sexism and sex and ability. The sexism by sex effect which was particularly relevant to the study was not supported. Viewing the total score criterion, there is evidence of an ability effect. Reports perceived to have been written by high ability children were rated higher than those perceived to have been written by low ability children. The effect was, however, restricted to the one (total) criterion.

TABLE 4

RESULTS OF THE ANALYSIS OF VARIANCE I: F RATIOS FOR MAIN EFFECTS AND INTERACTIONS

		Total		Global	
Source of Variation	df	F	p	F	p
Sexism (S)	1	.45	ns	.57	ns
Pupil Ability (PA)	1	2.79	.05*	1.23	ns
Pupil Sex (PS)	1	.77	ns	2.19	ns
S x PA	1	.02	ns	2.19	ns
S x PS	1	1.22	ns	1.66	ns
PA x PS	1	.01	ns	1.24	ns
S x PA x PS	1	.09	ns	.04	ns
Error	32				

I as determined by the first principal component
* one-tailed test

A second method for determining sexist groupings was on the basis of the response to the 9th item. As before, three rather than two identifiable groups were found. The first two were combined to form the 'contemporary group' and this consisted of persons who had indicated that girls liked science as much or more than boys liked science. The

traditionals were those who had agreed that boys liked science more than girls liked science.

The results of the 3 way analysis of variance using the 9th item for distinguishing the two groups are presented in Table 5. The results are similar to the last instance in which the principal component was used. The main effects of sexism and sex as expected were not significant. An interaction between sexism, sex and ability is not apparent however, there is evidence of an interaction between sexism and sex on the global score criterion. This interaction is illustrated in Figure 1. It shows that the traditionals did award higher scores to the male-authored reports and gave girls lower ratings. Contemporaries who believed that girls liked science as much or more than boys liked science, a contradiction of the stereotype, gave girls higher scores. The differences between the means were not significant although they were in the predicted direction.

TABLE 5

RESULTS OF THE ANALYSIS OF VARIANCE II:
F RATIOS FOR MAIN EFFECTS AND INTERACTIONS

			Total		Global	
Source of Variation		df	F	p	F	p
Sexism !	(S)	1	1.18	ns	.03	ns
Pupil Ability	(PA)	1	2.98	.05*	.77	ns
Pupil Sex	(PS)	1	.27	ns	1.25	ns
S x PA		1	.05	ns	.15	ns
S x PS		1	.76	ns	3.37	.04*
PAx PS		1	.29	ns	.03	ns
S x PA xPS		1	.04	ns	.03	ns
Error		32				

! as determined by item #9
* one-tailed test

TABLE 5a

MEAN SCORES OF SCIENCE REPORTS

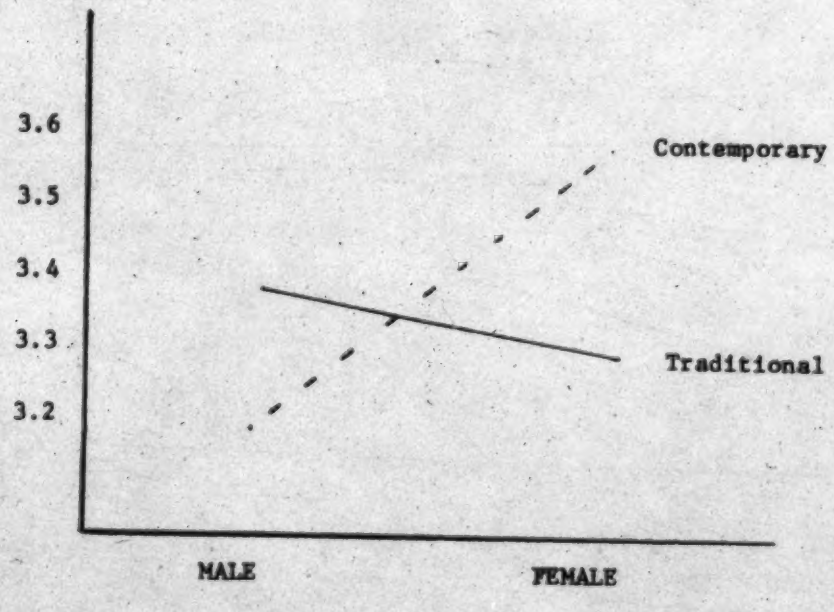
GLOBAL SCORES

		SEX	
		MALE	FEMALE
SEXISM	HIGH	3.4	3.3
	LOW	3.2	3.6

FIGURE 1

INTERACTION BETWEEN SEX-ROLE IDEOLOGY

AND PUPIL SEX BY GLOBAL SCORE



To test the effect of ability and sex in the larger sample, a 2 way analysis of variance was performed. The results of the 3 way analysis of variance just reported, supported the hypothesis that high ability children would be awarded higher grades and this finding was replicated with this larger sample lending support to the hypothesis. The effect was also noticeable on the global score criterion with the total sample. These findings are reported in Table 6.

TABLE 6

RESULTS OF THE 2 WAY ANALYSIS OF VARIANCE
F RATIOS FOR MAIN EFFECTS AND INTERACTIONS

Source of Variation	df	Total F	Total p	Global F	Global p
Pupil Ability (PA)	1	7.16	.01	3.69	ns
Pupil Sex (PA)	1	.069	ns	.588	ns
PA x PS	49	.132	ns	.317	ns

In addition to evaluating the reports, the students were encouraged to make additional comments to the reports but only three students took the opportunity to do so. Two students made suggestions to the children on means of improving the report while the third remarked that, considering the ability level of the child (which according to her reports was very low), the student was doing very well.

CHAPTER 5

DISCUSSION AND IMPLICATIONS FOR FURTHER RESEARCH

Pupil Ability

It is not unreasonable to expect a child of high ability and demonstrated academic achievement to do better on an academic task than a child who has not shown a similar potential. However, if a teacher allows apriori judgments to interfere with objectivity, the results may be damaging to both high and low ability children.

That teachers do in fact give more credit to a high ability child for work which is identical to that of his low ability peer was demonstrated in this study, a finding which is consistent with those of Finn (1972), Cahen (1969) and Simon (1969). The subjects knew only the ability and achievement test scores of the children and it is probable that the bias is magnified by first hand knowledge of the children when they have much more information at their disposal.

These results may have serious implications for the low ability child. Teacher expectations may place a ceiling on the demands which could be reasonably expected from him. A teacher may try to avoid demanding too much. As Brophy and Good (1970) have shown, if a child who was not expected to do well, did not immediately respond to a question, the teacher would very quickly turn to someone else. This may be an effort on her part to avoid embarassing the child. Unfortunately, the child who is denied a fair chance to respond, may take this as an indication that he is not expected to respond. When his performance is equivalent to, or even better than those in his class who are expected to excel, he may be denied the same recognition. Unless reinforced his

performance will indeed be that of a low ability child.

But what of his high ability peer? One might speculate that the judges would be very harsh in their marking of a mediocre report written by a high ability child. Wilson (1963) found that teachers who held high expectations for children did not mark them at their level and Finn (1972) found a similar effect when performance did not measure up to teacher expectation. These results did not support this finding. Rather, the child who is supposedly of high potential received the higher grade. He may soon realize that the quality of his work is largely irrelevant to the grade he receives. Having established the 'credit rating' of a high achiever, he is more likely to be given the benefit of the doubt concerning the quality of his work than the low achiever and it is possible that this quality may lapse.

The detrimental effects of the low ability label which this study confirms, have led some people to question the continued use of standardized testing in the schools. (McCurdy in Elashoff and Snow, 1971). Others (Sutherland and Goldschmid, 1972) insist that testing must continue because the performance of a high ability child might be adversely affected by low teacher expectations and standardized tests provide an objective measure to identify this child to the teacher.

Educators are thus caught in a double bind. A teacher might not expect a child of high ability to excel if she is ignorant of his potential but she may not encourage a child of low ability to try if she is cognizant of his presumed ability. Certainly many teachers are not sophisticated test interpreters or test users and this suggests that administrators and educators should exercise caution in employing standardized intelligence or achievement tests. It is essential too

that counsellors, teachers and students-in-training be exposed to courses which give them a firm basis in the use of psychological tests as well as the scope of interpretation and implication of such tests.

Stereotype Questionnaire

A second hypothesis of the study was that sexism of the teacher would bias her evaluation of students' work. Before this investigation could begin however, it was first necessary to test the validity of the concept of sexism itself. The review of the literature suggested a division of opinion. Spence and Helmerich (1973) and Bowers (1970) wrote that significant changes have taken place in men's and women's thinking about the sexes and that sexism is an outmoded concept which has given way to a more androgynous conception of the sexes. Others however, (Broverman, 1972; Rosenkrantz, 1968; and Toews, 1973) have observed that many of the stereotypes associated with males and females have prevailed even among college students who are presumed to be very liberal in their thinking.

Sex role ideology was perceived as a continuum with equality on the one pole and sexism on the other. To measure the position of any subject, a short form of the stereotype questionnaire was administered. If males and females were described in similar ways, this would be indicative of an androgynous attitude. An attitude of sexism could be assumed if large differences between men and women were reported. However, it is not only the extent of the differences perceived which is important to defining sex role ideology but the direction of the difference as well. In essence, two kinds of sexism can be presumed to exist: those people who see large differences between men and women consistent with the traditional norms assigned (e.g. men are more

aggressive than women) and those who also perceive large differences but who have reversed the stereotypes (e.g. women are more aggressive than men).

According to the results of this study, many of the stereotypes of men and women still persist. However, twelve of the forty-eight items, or one third, no longer applied. Thus all differences between the sexes have not been obliterated. But it seems likely that significant changes have taken place in the direction of more equalitarian thinking about the sexes.

Popular mythology presupposes that the female is nurturant/expressive/passive; the male is considered instrumental/aggressive/active (Freeman, 1972). While the study shows that this is still basically true, the results no longer support the active/passive dimension. Nor does it support other stereotypes which, taken as a group, indicate a changing conception of the competence of women. This competency cluster includes traits such as competitive, logical, direct, assertive, ambitious, objective, self-confident and able to separate feelings from ideas. Heretofore these characteristics were appropriate and socially desireable for men only. A competent woman was a social paradox. A woman could be one or the other, competent or feminine, but never both. Maccoby (1963) points out that females defy the conventions of appropriate female behaviour when they are dominant, independent and achievement oriented. Kagan (1964) and Bardwick and Douvan (1972) also note that femininity is jeopardized by competence. A high price had to be paid for competence in anxiety. Horner (1971) postulated that in order to avoid the defeminization which success might bring, females were motivated to avoid success. She found that

women reacted to success in other women with denial, fear of social rejection and concern about their normality or femininity. That competent women suffered discrimination and prejudice particularly in the job market is well documented by Bird (1971). Toews' (1973) findings show that such prejudice is likely to continue. College students asked to choose between men and women for tasks which demanded competence much preferred a 'man to do the job'.

It may be that women were their own worst enemies, as females were as likely to hold the prejudice as were males. For example, White (1950) found that women resented eminent women. Goldberg (1968) showed this prejudice extended even to judging success in fields normally dominated by women. Indeed, Toews (1973) found that the persons most likely to be prejudiced were those women who described themselves as competent. This may indicate that women in the vanguard of change cling to the stereotype.

It is obvious that little progress can be made toward equality of the sexes while such attitudes prevail. It is encouraging therefore that this sample recognized that a woman can be as competent as a man. These findings are consistent with those of Spence and Helmerich (1973) who found that men and women preferred competent women, at least more so than they do incompetent women.

However, the findings do not go as far as to explore a woman's view of her own competence. It may be that while she attributes competence to other women, she may not see herself in these terms. Both are essential for true equality.

As was previously noted the stereotypes which still prevail refer to male-female differences in the domains of warmth and

nurturance. Students perceived women as emotionally honest, sensitive, gentle and aware of the feelings of others.

McLelland (1965) argues that males and females ought to recognize these as strengths, not as weaknesses, and that higher value and greater social recognition should be placed on these characteristics. He suggests the failure of feminists has been their attempts to adopt the dominant male characteristics and severely questions the social desirability of woman as man's equal. Others, who feel the traditional status quo should be maintained, have urged a judicious re-examination of current sex-role standards (see for example, Weisstein, 1972).

On philosophical grounds it is argued that:

> . . . it is good for a being to be what he is supposed to be. Therefore for a man to be masculine and for a woman to be feminine is that which makes each an authentic human being and enhances the maturity of and the richness of personality. (Bieliauskas, 1965).

The results of this study indicate that many students are in agreement with the traditional cultural consensus of masculinity and femininity. There is a need to question whether these traditional conceptions are appropriate to our decade, or for that matter whether they were ever useful. Characteristics which are socially desirable for one sex should be equally desirable for the other. "If sensitivity, emotionality and warmth are desirable human characteristics, then they are desirable for men as well as for women . . . [likewise] independence, assertiveness and serious intellectual committment . . . are desirable for women as well as men." (Bem and Bem, 1971, p. 86).

For the same reasons that it is no longer acceptable to define a person's occupation or social station by the colour of his skin, it

is inappropriate to classify human behaviour by traditional sex role standards which have at best a specious validity..

There is some suggestion in the results that students are changing their conception of the sexes. The competency cluster is one such example in which characteristics formally reserved to the male of the species were attributed as well to the female. The fact that some students refused to respond because they were reluctant or unable to distinguish between men and women is another indication that the stereotypes are fading.

There is also evidence that others have abandoned the traditional stereotypes but have merely replaced these with others, equally sexist in orientation. This indicates a change in the conception of the sexes but one that is distant from the androgynous concept that Rossi (1964) describes.

These observations have considered the combined group of students. There was some disagreement on the magnitude of the male-female differences and thus in the factors which emerged, but the results generally are consistent with those of Broverman (1972) and Lunneborg (1970) in showing that men and women as a group are quite homogeneous in the perceptions of men and women. It would be inaccurate to conclude that either sex is any less stereotypic in their thinking than the other. The contention (Spence et al., 1973) that the changing attitudes of women toward their roles would make <u>their</u> judgments of other women less traditional than the men's is not supported by these results.

To summarize, many of the conventional stereotypes such as those relating to competence were not acknowledged, but this shows a trend, not a recision, for a number of stereotypes prevailed. The large number of characteristics used to discriminate between the sexes

and the direction in which these were applied suggest that varying degrees of sexism could be assumed to exist.

Teacher Sex-Role Ideology and Pupil Sex

As no strong competency effect emerged in the factor analysis of the male-female differences, the first principal component was judged to be the more appropriate measure.

The attempt to relate sexism to child's sex was not successful. Perhaps the most reasonable explanation for this lies in the fact that the differences which loaded heavily on the first principal component revolved to a large extent upon emotional attributes. Therefore, factors which played a large part in determining whether a person was a traditional or contemporary in sex role ideology may not have been relevant to the task at hand. Clearly the attitude that one sex is more emotional than the other does not preclude the possibility that either sex is equally capable of achieving. Under this determination of sexism, the traditional sexists could well have indicated that boys liked science less than girls or that there were no differences. The sexist grouping was thus largely irrelevant to the task. Had competence weighed heavily in the determination of the person's score, different results could have been expected. The nature of the study therefore demanded another measure of sexism.

The single most appropriate criterion was obviously the extent of the belief that boys like science more than girls like science. Using this criterion an interaction was found, showing that persons who adhered to the traditional stereotype that boys like science more than girls like science, awarded higher scores to the boys, while persons

who believed that girls liked science as much or more than boys gave girls higher scores. In fact, the score assigned to the female-authored report by this latter group exceeded both the scores which the first group assigned to males and females. This suggests that persons who believe that girls have a greater liking for science than boys may try to compensate for the stereotype by giving them better grades, and perhaps insuring that their attitude toward the subject will continue to be positive. It may also imply lower standards for girls, which if true would be unfortunate. A person who is truly non-sexist would have reacted similarly to the children regardless of sex.

Implications for Further Research

It is possible that further refinement of the experimental procedure would show stronger support for the hypothesis. In its present form the purpose of the study may have been too obvious for the subjects. These speculations concerning the transparency of the task seem warranted in light of at least one student's comment, "You're not really interested in inter-rater reliability but in teacher expectation of boys and girls."

Another consideration was that the subjects were student teachers who have not had extensive teaching experience and therefore have not had the chance to develop expectations or standards for children. A practising teacher may well have reacted differently. For example, Finn (1972) found that teachers took the opportunity to express their comments and disappointments on the essays they were requested to grade. Only three student-teachers in this group made additional comments to the science reports. This may indicate their inexperience in grading. As Finn notes, teachers develop a self-concept

as a provider and this, together with their teaching experiences and years of teaching, establish a general expectation level for student performance. "He will plan and regulate class activities to be consistent with that level and will resist changes which imply contradictory behaviour." (Finn, 1972, p. 397). For those who doubt this tendency Finn points to the resistance encountered when teachers and administrators are asked to change class procedures. Research in this area may try to explore these general expectation levels of teachers. Research might also examine the effect that the teacher's attitude to the curriculum has on her expectation. This may be more important than her attitude to the children in determining learning outcomes. Shrigley (1972) has suggested the need to compare the feelings of male and female teachers toward science as he suspects that female elementary teachers are less positive in attitude to science than males, but this hypothesis has yet to be confirmed. The teachers in this experimental group had chosen to study science teaching, but what of those students who do not make this choice and are then forced into the uncomfortable position of having to teach a subject in which they have neither interest nor competence?

It is reasonable to assume that the attitude of the science students toward science was positive, but the results indicate an adherence to the stereotypes that boys like science more than girls. We have seen the effect of this belief on grading behaviour. There may be other ways in which the stereotypes are communicated, unfortunately resulting in a loss of enthusiasm for half the class.

Kagan (1964) has suggested that the female science teacher may serve as an effective model in teaching boys and girls that science is

an appropriate activity for the female student. In order to do this she must first believe that girls can do as well as boys in science and become more confident in her own ability in this area. A teacher who emphasizes the contributions of both men and women to the field of science and who exposes children to male and female scientists and doctors, male and female artists and ballerinas, may help eradicate the early stereotyping of occupational fields (Garai and Scheinfeld, 1968; Rossi, 1965).

There are other sources of expectations which may be influential in determining the child's ultimate achievements. Curriculum materials often confirm and perpetuate the tradition-bound stereotypes. In reference to Science textbooks, the author of an Alberta study commissioned by the Human Rights Branch, had this to say:

> In Science, A Modern Approach Series, (Holt-Rinehart), Fischeler, et al., Copyright 1966, Grade 4 book, there are 105 illustrations of boys, and only 46 of girls. Two illustrations show girls watching boys and their activities, while another picture shows a girl baking a cake. There are pictures of male scientists, doctors, farmers, hunters, and pioneers. The stories of such famous men as Ptolemy, Galileo, and Copernicus are told. The only illustrations of women include a traditional mother and a pioneer woman who is cooking. No achievements of women are mentioned and women hold no professional positions. (Cullen, 1972).

Gaetano (1966) found a similar sex bias in the illustrations of science texts, which reinforce the belief that science is appropriate for boys only.

Sex role stereotyping is so prevalent that it is obvious in children's literature from early childhood throughout high school (U'Ren, 1971).

It is well known that peers may exert pressure on an individual child to perform in certain ways. For girls, success in science may well take the form of ridicule (Cohen, 1972; Jackson, 1968). Sex-

typing and the acquisition of sex-appropriate behaviour occurs at an early age. "Preschool children as a group become fully aware of the fact that the world is divided into two groups of people and that, depending on whether one belongs to one group or the other, different behaviour patterns are expected accordingly." (Brown, 1958, p. 233). Certainly by school age, the child has acquired sex role standards (Brown, 1958; Hurlock, 1972; Kagan, 1964). When the child himself acquires the expectation that certain behaviours are appropriate and others inappropriate, it is difficult to " . . . cross these culturally given frontiers." (Kagan and Moss, reported by Freeman, 1972). The child is reluctant to compromise his friends and the stability of his self concept (Hurlock, 1972; Kagan, 1964). The loss in masculinity and femininity which results from partaking of forbidden fruits is similar to that of the adult.

Many of these behaviours are acquired through a very successful socialization process. Not only do parents encourage their children to act in sex-appropriate ways, they also divert their interest in a sex-appropriate direction. The observations of the Bems (1970) are not exaggerations. The girl excited about biology is counselled to consider a career in nursing; her male counterpart will be encouraged to be a doctor. At Christmas time who is more likely to receive the chemistry and microscope sets? And if the message is not thereby understood, it is very clearly spelled out when children approach their parents for help. "All children quickly learn that mommy is proud to be a moron when it comes to math and science, whereas daddy knows all things." (Bem, 1970, p. 87). The parents of a girl with a scientific bent are more likely to be as "horrified by the prospect of a permanent love

affair with physics as they would be by the prospect of an interracial marriage." The changing nature of the stereotypes which this study supports may have the effect of easing such anxieties.

The media reinforce parent's teachings. Consider, for example, a "Matel" ad in Life magazine; "Because girls dream of being a ballerina Matel makes Dollerina . . . a pink confection in a silken blouse and ruffled tutoo. Because boys were born to build and learn, Matel makes Togl for creative play." (Komisar, 1970). Advertising such as this may provide another reason for banning advertisements directed at children.

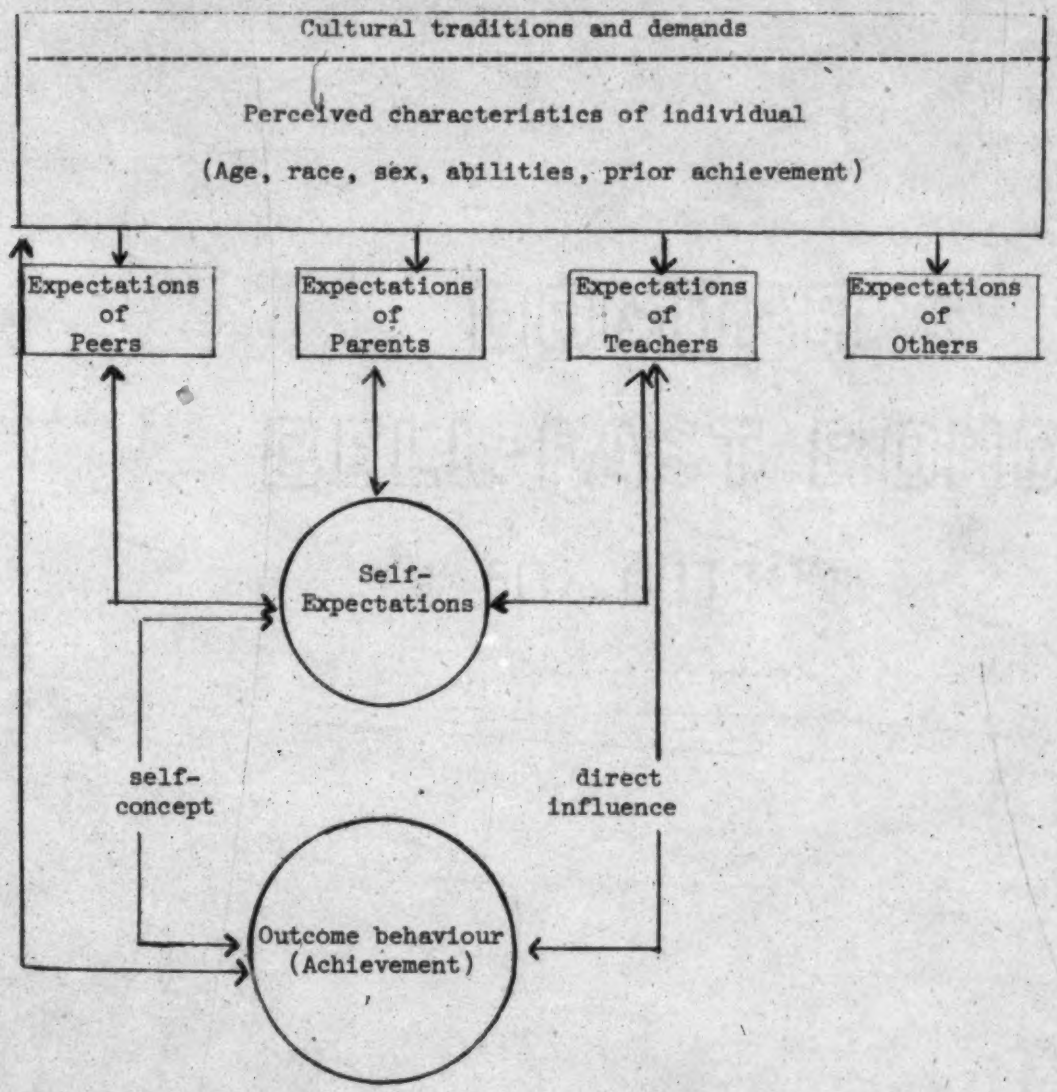
Certainly the situation is not entirely grim as changes are occurring. This study indicates that at least teachers-in-training are refuting many of the stereotypes. The school practice of limiting enrolment on the basis of sex alone is being challenged and there is evidence that more freedom of choice is being extended to the students. Even textbook publishers sound apologetic and sincere in their promise to eliminate instances of sex-role stereotyping in the books they publish. As one man said:

> I am sure this happened quite unintentionally and unconsciously, though that may merely tend to confirm how deep and instinctive such stereotypes go . . . I would also agree that textbook companies have a particularly great responsibility to avoid stereotyping of any kind, just as we now attempt to do in depicting members of minority groups. (Quoted in Sadker, 1973, p. 10).

In summary, a more subtle approach toward tapping teacher expectations may be needed to provide support for the hypothesis. It is essential too, to consider the many sources of expectations besides those of the teacher which impinge on the child. The model Finn provides for conceptualizing the origins and impact of these various expectations is most useful in this regard.

Inspection of Finn's diagram reveals the complexity of the

Figure 2
Network of Expectations



(adapted from Finn, 1972, p. 395)

expectation network. It shows that expectations for the child emanate not only from the classroom teacher but from all persons the child is exposed to. These expectations may have a direct effect on the child's achievement as in the case of the teacher who, expecting a certain standard of performance by a child, insures this through grading him in accordance with these expectations. The expectations may affect the

child's expectations for himself which are important in determining his eventual achievements. The expectation network is in turn embedded in the cultural tradition and value orientations of the society.

The study focused on the sex-typed beliefs of the teacher and the perceived ability level and sex of the child and showed that these three factors influence student teacher evaluations of children's performance. These findings elucidate the first two steps of the Brophy and Good (1970) model: how teacher expectation may develop and how differential expectations may affect a teacher's response to her pupils. There is a need to explore other factors which determine teachers' expectations and to clarify how these expectations are communicated to the child.

Research is also necessary to establish the effect of differential teacher behaviour on the child's behaviour. The hypothesis that children respond to differential teacher behaviour in ways which reinforce the teacher's expectations needs confirmation. Longitudinal research which would have the advantage of studying the changes in teacher and student behaviour over a period of time would be best suited to this purpose.

Finally, research should extend beyond teacher expectations to a consideration of the effect of the expectations of the total educational environments on the child's performance (Finn, 1972). Buckley (1968) and Grieger (1972) suggest that the effects of teacher expectation itself are not very great and often reflect more the wishes of the experimenter than those of the teacher herself. Rosenthal (1968) has documented that the wishes of the experimenter can and do influence research findings and further research in the sensitive area of teacher

expectation should try to control for experimenter intervention.

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APPENDIX A

STEREOTYPE QUESTIONNAIRE

We would like to know something about what people expect other people to be like. Imagine that a new student is admitted to your class and the only thing you know in advance is that the student is female*. What sort of things would you expect? For example, what would you expect about her liking or disliking the colour red? On each scale, please put a slash(/) according to what you think the new girl is like.

For example:

strong liking for the colour red — strong dislike for the colour red

1.....2.....3.....4.....5.....6.....7

On the following pages are a number of scales like the one above. Please place a slash(/) according to what you expect a female student to be like. You may put your slash anywhere on the line, not just at the numbers. PLEASE BE SURE TO MARK EVERY ITEM. Start with the example below.

very interested in athletics — not at all interested in athletics

1.....2.....3.....4.....5.....6.....7

* the word male is substituted in the male directions

Now we would like you to go through the same scales for a second time. Imagine that a new student is admitted to your class and the only thing you know in advance is that the student is male*. What sort of things would you expect? Please place a slash(/) according to what you expect a male student to be like. You may put your slash anywhere on the line, not just at the numbers. PLEASE BE SURE TO MARK EVERY ITEM. Start with the example below.

very interested in athletics — not at all interested in athletics

1.....2.....3.....4.....5.....6.....7

*the word female is substituted in the female directions

We would like to know something about what people expect other people to be like. Imagine that you are going to meet someone for the first time, and the only thing that you know in advance is that he is an adult male.*What sort of things would you expect? For example, what would you expect about his liking or disliking of the colour red? On each scale, please put a slash (/) according to what you think an adult male is like.

For example:

Strong dislike for the colour red — Strong liking for the colour red

1.....2.....3.....4.....5.../.....6.....7

On the following pages are a number of scales like the one above. Please place a slash according to what you expect an adult male to be like. You may put your slash anywhere on the scale, not just at the numbers. PLEASE BE SURE TO MARK EVERY ITEM. Start with the example below.

Very interested in athletics — Not at all interested in athletics

1.....2.....3.....4.....5.....6.....7

*adult female is substituted in the female directions

Now we would like you to go through these same scales for a second time. We would like to know something about what people expect other people to be like. Imagine that you are going to meet someone for the first time, and the only thing that you know in advance is that she is an adult female*. What sort of things would you expect? On each scale, please put a slash according to what you think an adult female is like. PLEASE BE SURE TO MARK EVERY ITEM. Start with the example below.

Very interested in athletics — Not at all interested in athletics

1.....2.....3.....4.....5.....6.....7

*adult male is substituted in the male directions

1.very aggressive	1.....2.....3.....4.....5.....6.....7	not at all aggressive
2.very independent	1.....2.....3.....4.....5.....6.....7	not at all independent
3.not at all emotional	1.....2.....3.....4.....5.....6.....7	very emotional
4.very subjective	1.....2.....3.....4.....5.....6.....7	very objective
5.very easily influenced	1.....2.....3.....4.....5.....6.....7	not at all easily influenced
6.does not hide emotions at all	1.....2.....3.....4.....5.....6.....7	almost always hides emotions
7.not at all talkative	1.....2.....3.....4.....5.....6.....7	very talkative
8.very submissive	1.....2.....3.....4.....5.....6.....7	very dominant
9.likes math and science very much	1.....2.....3.....4.....5.....6.....7	dislikes math and science very much
10.not at all excitable in a minor crisis	1.....2.....3.....4.....5.....6.....7	very excitable in a minor crisis
11.very passive	1.....2.....3.....4.....5.....6.....7	very active
12.very tactful	1.....2.....3.....4.....5.....6.....7	very blunt

13.very rough — very gentle

1.....2.....3.....4.....5.....6.....7

14.not at all competitive — very competitive

1.....2.....3.....4.....5.....6.....7

15.very illogical — very logical

1.....2.....3.....4.....5.....6.....7

16.very helpful — not at all helpful

1.....2.....3.....4.....5.....6.....7

17.very eager — not at all eager

1.....2.....3.....4.....5.....6.....7

18.very direct — very sneaky

1.....2.....3.....4.....5.....6.....7

19.feelings easily hurt — feelings not easily hurt

1.....2.....3.....4.....5.....6.....7

20.not at all adventurous — very adventurous

1.....2.....3.....4.....5.....6.....7

21.not at all aware of feelings of others — very aware of feelings of others

1.....2.....3.....4.....5.....6.....7

22.not at all assertive — very assertive

1.....2.....3.....4.....5.....6.....7

23.not at all interested in own appearance — very interested in own appearance

1.....2.....3.....4.....5.....6.....7

24.very respectful — very disrespectful

1.....2.....3.....4.....5.....6.....7

25.can make decisions easily

1.....2.....3.....4.....5.....6.....7

has difficulty making decisions

26.never gives up easily

1.....2.....3.....4.....5.....6.....7

gives up easily

27.not at all outgoing

1.....2.....3.....4.....5.....6.....7

very outgoing

28.does things without being told

1.....2.....3.....4.....5.....6.....7

never does things without being told

29.never cries

1.....2.....3.....4.....5.....6.....7

cries very easily

30.almost never acts as a leader

1.....2.....3.....4.....5.....6.....7

almost always acts as a leader

31.very sloppy in habits

1.....2.....3.....4.....5.....6.....7

very neat in habits

32.very quiet

1.....2.....3.....4.....5.....6.....7

very loud

33.not at all self-confident

1.....2.....3.....4.....5.....6.....7

very self-confident

34.not at all uncomfortable about feeling aggressive

1.....2.....3.....4.....5.....6.....7

very uncomfortable about feeling aggressive

35.very little need for security

1.....2.....3.....4.....5.....6.....7

very strong need for security

36.very ambitious

1.....2.....3.....4.....5.....6.....7

not at all ambitious

37.easily able to separate feelings from ideas

1.....2.....3.....4.....5.....6.....7

unable to seperate feelings from ideas

38.not at all dependent

1.....2.....3.....4.....5.....6.....7

very dependent

39.very defiant

1.....2.....3.....4.....5.....6.....7

very compliant

40.enjoys art and literature

1.....2.....3.....4.....5.....6.....7

does not enjoy art and literature

41.very conceited about appearance

1.....2.....3.....4.....5.....6.....7

never conceited about appearance

42.not very co-operative

1.....2.....3.....4.....5.....6.....7

very co-operative

43.very obedient

1.....2.....3.....4.....5.....6.....7

very disobedient

44.not at all reckless

1.....2.....3.....4.....5.....6.....7

very reckless

45.very insensitive

1.....2.....3.....4.....5.....6.....7

very sensitive

46.never thinks before acting

1.....2.....3.....4.....5.....6.....7

always thinks before acting

47.very troublesome

1.....2.....3.....4.....5.....6.....7

not at all troublesome

48.very careful

1.....2.....3.....4.....5.....6.....7

very careless

APPENDIX B

SAMPLE SCIENCE BOOKLET

In conjunction with their science program,students were required to complete a specified number of experiments during the term.The following reports were submitted by two grade 5 students on,'The Forces of Attraction'.

Some biographical information is provided to give you additional information about the child who wrote the report.

You are asked to evaluate the reports on the rating forms. The rating is on a five point scale ranging from very poor to very good. You may place your rating anywhere on the line,not just at the numbers.

For example:

very poor very good

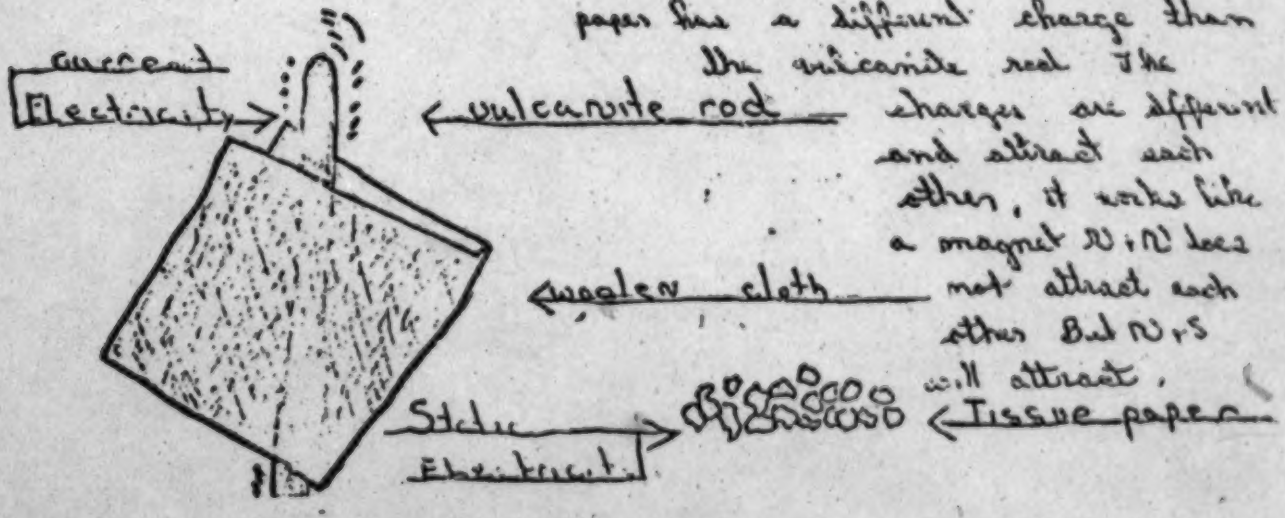
clarity: 1.....2.....3...../....4.....5

Please feel free to add any further marks or comments on the reports, or the rating form.

JOAN: grade 5; age 10.

Psychometric rating as determined by the Lorge Thorndike Intelligence Test place Joan in the high range of mental ability. (IQ, 120) Joan ranks high in a standardized science achievement test. (88th percentile) Her performance in Science and in other school subjects has been good.*

We used a vulcanite rod
a piece of wool
and some tissue paper.
We then rubbed the vulcanite rod
in the piece of wool.
This caused friction which
caused electricity and since
it was electricity charged it
picked up the tissue paper.
The electricity (static electricity)
picked up or {attracted} the tissue
paper. Since the tissue
paper has a different charge than
the vulcanite rod the
charges are different
and attract each
other, it works like
a magnet N + N does
not attract each
other But N + S
will attract.



*(In the corresponding booklet the child was identified as having an I.Q. of 85 and as being in the 30th percentile in the achievement test.)

RATING FORM

a) Clarity — very poor 1.....2.....3.....4.....5 very good

b) Thoroughness — very poor 1.....2.....3.....4.....5 very good

c) Accuracy — very poor 1.....2.....3.....4.....5 very good

d) Organization — very poor 1.....2.....3.....4.....5 very good

e) Presentation — very poor 1.....2.....3.....4.....5 very good

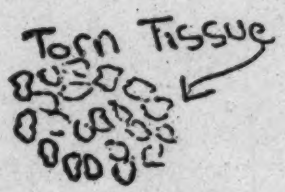
f) Overall quality — very poor 1.....2.....3.....4.....5 very good

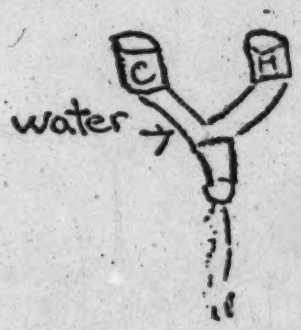
TOM: grade 5; age 10.

The results of the Lorge Thorndike Intelligence Test indicate Tom is in the high range of mental ability. (IQ,118) In a standardized science achievement test Tom's score is high.(90th percentile) His grades in Science and his overall school achievements have generally been good.

Force of Attraction

First we took a piece of tissue and ripped it into shreds then we rubbed a vulcinate rod in the tissue, then we rubbed the rod on a piece of fur then we rubbed the rod back on the ~~tissue~~ tissue again. We carried the rod over to the tap and turned it on and held the rod close to the water. The water bent towards the rod because the fur and the tissue had static electrons in them. When we rubbed the rod on them the electrons transfered from the fur and tissue to the rod and that is what made the ~~electrons~~ water bend toward the rod.





RATING FORM

a) Clarity — very poor ..... very good
1.....2.....3.....4.....5

b) Thoroughness — very poor ..... very good
1.....2.....3.....4.....5

c) Accuracy — very poor ..... very good
1.....2.....3.....4.....5

d) Organization — very poor ..... very good
1.....2.....3.....4.....5

e) Presentation — very poor ..... very good
1.....2.....3.....4.....5

f) Overall quality — very poor ..... very good
1.....2.....3.....4.....5

APPENDIX C

RESULTS OF PRINCIPAL COMPONENT ANALYSIS (VARIMAX ROTATION)

ROTATED FACTORS

RESULTS OF PRINCIPAL COMPONENT ANALYSIS IN THE MALE SAMPLE
(VARIMAX ROTATION)

	COMMUNALITIES	1	2	3	4	5	6	7	8	9	10
1	0.835	-0.130	0.134	0.056	0.778	0.242	-0.014	-0.309	0.008	0.043	0.105
2	0.777	-0.125	0.027	-0.016	0.195	-0.022	0.236	0.149	-0.089	-0.233	-0.058
3	0.795	-0.088	0.168	-0.150	0.608	-0.382	0.022	-0.027	-0.165	0.029	-0.311
4	0.818	0.061	0.027	0.010	-0.006	-0.009	-0.097	0.031	0.005	0.874	-0.007
5	0.791	0.389	-0.190	0.211	0.138	0.305	0.248	0.109	0.046	0.412	-0.046
6	0.685	0.074	-0.026	-0.051	0.004	0.779	-0.025	0.000	0.137	0.044	-0.060
7	0.743	-0.115	0.741	0.285	0.090	-0.555	0.080	0.038	0.137	-0.025	0.091
8	0.813	0.317	0.049	0.125	-0.187	0.121	0.021	-0.135	0.430	0.145	0.154
9	0.775	-0.060	0.329	0.055	0.054	0.004	-0.057	-0.042	0.001	-0.140	0.089
10	0.643	-0.113	0.306	-0.188	0.376	-0.351	0.138	0.117	-0.000	0.037	0.075
11	0.674	0.457	-0.119	0.196	-0.328	0.072	-0.103	0.378	-0.179	0.387	-0.018
12	0.801	0.027	-0.114	-0.053	-0.054	0.117	0.067	-0.003	0.664	-0.011	-0.013
13	0.694	-0.060	0.214	-0.075	0.601	-0.201	-0.010	0.158	-0.213	-0.147	0.032
14	0.707	0.466	-0.047	0.165	-0.336	0.023	-0.058	-0.140	-0.033	0.953	0.080
15	0.750	0.368	-0.214	0.197	0.043	0.085	-0.459	0.148	-0.081	0.246	-0.060
16	0.692	-0.017	-0.148	-0.305	0.025	-0.137	0.321	-0.066	0.485	-0.144	-0.045
17	0.769	0.162	-0.194	-0.382	0.184	0.252	0.099	-0.196	0.149	0.113	0.354
18	0.783	-0.096	0.049	-0.096	0.016	-0.387	0.092	0.065	-0.071	-0.066	0.815
19	0.756	0.430	-0.028	0.347	-0.202	0.393	-0.063	-0.098	-0.049	0.031	0.022
20	0.797	0.636	0.041	0.151	-0.376	0.114	0.005	0.093	0.019	0.068	-0.140
21	0.709	-0.122	0.565	-0.128	0.096	0.012	-0.261	0.256	-0.255	0.072	-0.071
22	0.773	0.315	-0.233	0.471	0.047	0.055	-0.055	-0.099	-0.065	0.040	0.439
23	0.656	-0.115	0.048	0.007	-0.048	0.046	-0.039	-0.161	-0.084	-0.031	0.235
24	0.767	-0.015	-0.057	0.162	0.026	0.289	0.069	0.350	0.259	-0.221	0.195
25	0.765	-0.119	0.358	0.003	0.259	-0.133	0.612	-0.153	-0.071	-0.134	0.301
26	0.742	-0.103	0.197	-0.161	0.130	-0.210	0.623	-0.022	0.037	-0.041	0.165
27	0.812	0.543	0.017	0.842	-0.067	-0.220	-0.135	0.026	-0.049	0.025	-0.014
28	0.817	-0.196	-0.099	-0.125	-0.060	0.090	0.804	0.110	0.169	0.023	-0.010
29	0.723	-0.147	0.068	-0.175	0.499	-0.309	0.272	-0.192	0.276	-0.019	-0.142
30	0.723	0.048	-0.158	0.555	-0.124	0.281	-0.194	0.010	0.155	0.186	-0.027
31	0.660	-0.117	0.611	-0.014	0.384	-0.156	0.093	0.160	-0.209	-0.150	0.185
32	0.743	0.082	-0.178	0.595	0.011	0.037	0.011	-0.205	-0.187	-0.067	-0.170
33	0.817	0.234	-0.073	0.719	-0.002	-0.008	-0.013	0.161	-0.008	-0.064	-0.088
34	0.631	-0.081	0.760	-0.027	0.139	-0.049	0.068	-0.087	-0.015	0.064	-0.094
35	0.848	-0.136	0.834	-0.151	0.196	-0.095	0.144	-0.153	0.021	-0.128	-0.269
36	0.695	-0.517	0.273	0.007	0.126	0.271	0.293	-0.099	-0.075	-0.187	-0.140
37	0.767	-0.165	0.354	-0.164	0.209	-0.037	0.134	-0.088	0.364	-0.270	-0.095
38	0.722	-0.090	-0.013	0.038	0.006	0.141	0.020	0.001	0.036	-0.019	-0.014
39	0.710	-0.066	-0.013	-0.062	0.185	-0.365	0.220	0.102	-0.034	0.111	-0.106
40	0.702	0.595	-0.014	-0.386	0.042	0.212	-0.217	-0.028	-0.032	0.078	-0.039
41	0.704	-0.017	0.169	-0.338	0.006	0.042	-0.139	0.411	-0.139	-0.498	-0.140
42	0.801	-0.008	0.193	0.139	-0.102	0.089	-0.182	0.295	-0.007	-0.041	-0.140
43	0.777	0.025	-0.185	-0.085	-0.079	-0.048	-0.060	0.030	-0.053	0.156	0.818
44	0.747	0.076	-0.403	0.041	-0.168	0.308	0.049	-0.324	-0.227	0.435	-0.033
45	0.794	-0.763	0.114	0.041	0.032	-0.033	0.060	0.190	-0.121	0.087	-0.014
46	0.748	-0.642	-0.079	0.014	0.036	0.060	-0.046	0.861	-0.057	0.102	-0.068
47	0.790	0.019	-0.318	-0.011	0.130	-0.005	0.039	0.080	0.004	-0.076	-0.072
48	0.220	-0.069	-0.272	0.273	0.091	0.394	-0.180	-0.036	-0.015	0.075	-0.012
(N=92)	35.091	4.092	3.748	2.642	2.548	2.519	2.357	2.261	2.043	1.933	1.987

ROTATED FACTURS

RESULTS OF PRINCIPAL COMPONENT ANALYSIS IN THE FEMALE SAMPLE *

(VARIMAX ROTATION)

	COMMUNALITIES	1	2	3	4	5	6	7	8	9	10
1	0.703	0.123	0.018	0.141	0.691	-0.025	-0.062	0.065	-0.143	0.098	0.031
2	0.550	0.223	0.179	-0.090	0.690	0.014	0.233	0.285	0.001	0.149	0.135
3	0.766	0.680	0.189	0.054	0.102	-0.024	0.046	-0.116	-0.428	0.057	0.062
4	0.739	0.028	-0.043	-0.016	0.071	-0.018	0.034	0.065	-0.003	0.819	-0.053
5	0.660	-0.581	-0.086	-0.234	-0.206	0.098	0.087	0.022	-0.177	-0.115	-0.240
6	0.767	-0.737	-0.070	0.091	-0.069	0.058	0.037	-0.127	-0.007	0.066	0.018
7	0.743	0.458	-0.202	0.205	-0.084	-0.031	-0.012	-0.025	-0.039	-0.059	0.805
8	0.673	-0.190	-0.284	-0.197	-0.465	-0.129	-0.013	0.032	-0.120	-0.064	-0.280
9	0.643	0.026	0.709	0.188	0.019	-0.099	-0.154	-0.115	0.004	0.015	0.011
10	0.726	0.379	0.414	0.155	0.153	0.140	-0.208	0.100	0.204	0.069	0.176
11	0.587	-0.097	0.023	-0.077	0.023	0.020	-0.031	-0.165	0.164	0.004	-0.007
12	0.761	-0.102	0.119	-0.151	-0.235	0.028	0.049	0.135	0.402	-0.079	-0.064
13	0.659	0.259	0.092	0.047	0.300	-0.032	-0.163	-0.075	-0.149	0.087	0.065
14	0.721	-0.133	0.067	-0.102	-0.333	-0.128	0.025	0.006	0.159	-0.056	-0.005
15	0.744	-0.175	-0.076	-0.137	0.024	0.054	0.043	-0.083	0.040	0.304	-0.157
16	0.729	0.065	-0.027	0.345	-0.100	0.075	0.247	0.629	-0.123	-0.061	-0.100
17	0.770	-0.114	-0.019	0.125	-0.082	0.067	-0.014	0.803	0.096	-0.003	0.045
18	0.728	-0.045	0.139	0.717	0.173	-0.096	0.042	0.182	-0.016	-0.064	0.064
19	0.712	-0.178	-0.377	-0.089	-0.280	0.003	0.074	0.129	0.053	-0.161	-0.193
20	0.676	-0.059	0.066	-0.198	0.002	-0.217	0.331	-0.166	0.194	-0.466	0.076
21	0.617	0.506	0.092	-0.421	0.221	-0.081	-0.118	-0.028	0.025	0.131	0.112
22	0.756	-0.091	0.041	-0.172	-0.181	0.048	0.169	-0.049	0.337	0.652	0.005
23	0.687	0.520	0.227	0.025	0.122	0.038	0.161	-0.104	-0.101	-0.227	-0.286
24	0.720	0.145	-0.010	0.071	-0.110	-0.064	0.102	0.042	-0.049	-0.085	-0.061
25	0.666	0.135	0.161	0.737	0.040	0.079	-0.091	0.095	0.021	-0.026	0.038
26	0.851	0.104	-0.033	0.585	0.039	-0.056	-0.092	0.021	0.430	0.093	-0.112
27	0.704	-0.045	0.122	0.029	-0.054	0.283	0.239	-0.673	0.133	-0.167	-0.046
28	0.710	-0.038	0.147	0.187	0.007	-0.232	-0.209	0.114	0.550	0.070	-0.067
29	0.776	0.571	0.251	0.220	0.276	-0.090	-0.193	-0.035	-0.107	-0.064	0.682
30	0.714	-0.292	-0.135	-0.214	0.096	-0.102	0.542	-0.060	-0.089	0.202	-0.239
31	0.645	0.407	0.161	0.084	0.139	0.017	-0.134	-0.089	-0.087	-0.178	0.061
32	0.575	0.058	-0.331	0.029	0.111	-0.058	0.612	0.080	-0.059	0.061	0.114
33	0.664	-0.074	-0.033	-0.064	-0.045	0.007	0.054	-0.028	-0.068	0.085	-0.079
34	0.714	0.169	0.062	-0.077	0.701	0.038	-0.116	-0.091	-0.184	-0.255	0.050
35	0.754	0.245	0.748	0.025	0.034	0.223	0.019	-0.047	-0.017	0.001	0.190
36	0.777	0.047	0.041	0.210	-0.038	0.077	-0.108	0.072	0.031	0.085	0.021
37	0.668	-0.023	0.406	0.225	0.291	-0.033	-0.093	-0.024	-0.068	-0.120	0.562
38	0.686	0.269	0.438	0.201	0.095	-0.269	-0.221	-0.311	-0.182	-0.087	0.074
39	0.706	0.070	0.041	0.028	-0.026	0.224	-0.266	0.124	-0.281	-0.208	0.320
40	0.774	-0.148	-0.183	-0.035	-0.085	-0.066	0.042	-0.121	0.103	0.046	-0.045
41	0.737	-0.[illegible]	-0.043	-0.136	0.084	0.610	-0.208	-0.065	0.194	-0.014	0.341
42	0.772	0.069	0.225	-0.228	0.270	0.572	-0.143	0.211	0.223	0.021	-0.069
43	0.709	-0.125	-0.225	0.123	-0.144	-0.142	-0.032	-0.049	-0.032	0.031	-0.719
44	0.628	-0.039	0.047	0.127	-0.120	-0.179	0.514	-0.152	0.145	-0.051	-0.241
45	0.722	0.220	0.559	-0.107	0.225	-0.068	0.035	0.305	-0.043	-0.261	0.064
46	0.606	-0.022	-0.104	0.037	0.050	0.032	-0.149	-0.053	-0.063	0.138	0.033
47	0.736	-0.079	0.168	-0.009	-0.071	0.818	0.037	0.010	-0.097	-0.028	0.369
48	0.669	-0.086	-0.393	0.046	-0.273	0.060	0.156	-0.127	0.691	0.094	0.070
(N=112)		33.820	2.404	2.779	2.517	2.456	2.353	2.250	2.120	2.007	1.966	1.953

APPENDIX D

RESULTS OF PRINCIPAL COMPONENT ANALYSIS
(UNROTATED FACTOR MATRIX)

RESULTS OF PRINCIPAL COMPONENT ANALYSIS IN THE FEMALE SAMPLE *

UNROTATED FACTOR MATRIX

	COMMUNALITIES	1	2	3	4	5	6	7	8	9	10
1	0.704	0.544	-0.023	-0.187	0.364	0.187	-0.121	-0.028	0.040	-0.121	0.157
2	0.350	0.447	-0.124	-0.051	0.471	0.249	0.074	-0.321	0.140	-0.048	0.147
3	0.736	0.649	-0.110	-0.258	-0.024	-0.032	0.247	0.150	-0.177	0.033	0.096
4	0.738	-0.189	0.314	0.047	0.269	0.633	0.134	0.175	0.035	0.152	0.228
5	0.660	-0.502	0.214	-0.082	0.151	-0.219	-0.363	-0.105	-0.097	-0.075	0.001
6	0.787	-0.531	0.193	0.163	-0.024	-0.078	-0.279	-0.118	0.190	-0.141	0.153
7	0.743	0.470	-0.024	-0.135	-0.053	0.043	0.251	0.055	0.193	-0.329	-0.168
8	0.473	-0.504	-0.100	-0.252	-0.059	-0.126	0.115	0.144	0.037	-0.234	-0.343
9	0.493	0.389	-0.067	0.121	-0.465	0.381	-0.199	0.024	0.131	-0.109	0.059
10	0.726	0.833	-0.012	0.273	-0.263	0.170	0.227	-0.121	0.041	0.085	0.037
11	0.687	-0.175	0.244	-0.149	-0.339	0.169	-0.095	0.047	0.443	-0.263	-0.053
12	0.791	-0.324	0.019	0.171	-0.385	0.031	0.228	-0.058	0.462	0.027	-0.090
13	0.659	0.538	0.121	-0.295	0.143	0.184	-0.088	0.163	0.158	-0.259	-0.040
14	0.721	-0.369	-0.149	-0.085	-0.158	0.192	-0.196	-0.442	-0.210	0.193	0.000
15	0.785	-0.333	0.301	-0.046	0.031	0.141	-0.059	0.004	0.434	0.420	0.274
16	0.729	-0.015	-0.335	0.263	0.327	-0.178	0.143	-0.348	0.261	0.066	0.170
17	0.730	0.042	-0.142	0.353	0.478	0.012	0.064	-0.238	0.352	-0.075	-0.193
18	0.778	0.346	-0.524	0.312	0.097	-0.045	-0.270	-0.009	0.203	-0.058	0.150
19	0.712	-0.519	-0.021	0.025	0.150	-0.332	0.188	0.054	0.302	0.193	0.074
20	0.676	-0.088	-0.092	-0.443	-0.359	-0.218	-0.062	-0.232	0.319	0.054	-0.036
21	0.617	0.432	0.191	-0.388	0.068	0.231	0.108	0.021	-0.224	0.277	-0.183
22	0.756	-0.250	0.203	0.082	-0.058	0.710	0.017	-0.118	-0.058	0.123	-0.116
23	0.688	0.392	-0.060	-0.360	-0.242	0.019	-0.094	0.014	0.048	-0.052	0.051
24	0.720	0.020	-0.417	0.010	-0.174	-0.179	0.616	0.051	-0.003	-0.125	0.040
25	0.666	0.371	-0.331	0.503	-0.071	-0.021	-0.011	0.133	0.113	-0.203	0.169
26	0.851	0.154	-0.395	0.445	0.077	0.271	-0.095	0.294	-0.026	0.041	0.118
27	0.704	-0.130	0.235	-0.154	-0.019	-0.248	0.019	0.041	-0.033	-0.024	0.372
28	0.711	-0.025	-0.134	0.447	-0.227	0.288	-0.323	0.055	0.062	0.125	-0.238
29	0.776	0.747	-0.168	0.028	-0.092	-0.174	0.215	0.156	0.119	0.233	-0.025
30	0.715	-0.493	-0.222	-0.437	0.077	0.281	0.102	-0.135	-0.010	-0.165	0.270
31	0.685	0.446	0.165	-0.270	-0.013	-0.074	-0.239	0.100	0.237	0.154	0.179
32	0.575	-0.152	-0.315	-0.245	0.149	0.193	0.203	-0.280	-0.023	-0.147	0.303
33	0.664	-0.244	0.057	-0.213	0.021	0.128	0.208	0.147	0.247	-0.251	0.260
34	0.714	0.437	0.220	-0.157	0.063	-0.166	-0.111	0.069	0.074	-0.041	0.107
35	0.754	0.570	0.186	0.125	-0.337	0.093	-0.084	-0.273	-0.111	0.050	0.087
36	0.777	0.025	0.351	0.475	-0.026	0.033	0.007	0.201	0.143	-0.024	-0.011
37	0.688	0.442	0.014	0.309	-0.128	-0.124	-0.206	-0.204	-0.230	-0.165	0.116
38	0.596	0.547	-0.155	-0.045	-0.317	-0.117	-0.054	0.215	-0.071	0.254	0.103
39	0.706	0.218	0.169	0.271	0.141	-0.481	0.006	-0.060	0.099	0.260	0.072
40	0.774	-0.436	-0.133	0.266	-0.040	-0.035	-0.095	0.135	-0.395	0.072	0.215
41	0.737	-0.102	0.566	0.426	-0.097	-0.059	0.280	0.002	-0.021	-0.215	-0.019
42	0.702	0.113	0.556	0.082	0.140	0.047	0.193	-0.137	-0.065	0.302	0.089
43	0.756	-0.453	-0.286	-0.069	0.047	-0.050	-0.165	0.409	0.098	0.162	0.149
44	0.628	-0.290	-0.473	-0.248	-0.381	-0.028	0.190	-0.142	-0.013	0.193	0.246
45	0.722	0.574	0.316	-0.103	-0.024	-0.047	-0.262	-0.431	0.101	0.093	-0.190
46	0.636	-0.016	0.395	0.239	0.139	0.050	0.149	0.162	0.041	-0.185	0.155
47	0.739	0.020	0.525	0.179	-0.005	-0.043	0.211	-0.237	-0.039	-0.134	0.360
48	0.669	-0.361	-0.084	0.248	-0.379	0.318	0.145	-0.132	-0.041	0.139	-0.137
	33.832	7.237	3.343	3.112	2.566	2.188	1.848	1.801	1.681	1.534	1.422

*N=112